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...some super scenes

CHRISTMAS BOX
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Plus graphics from MAG

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WARLOCKS
EXCLUSIVE FROM NETWORK 23
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...power processing
spreadsheet demo from Colton Software

Plus 7 great game cheats from Hal in the Databay

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productivity and integration

Resultz is the power-packed spreadsheet that gets the answer first. Whether you're working with statistics, finance or arithmetic, Resultz and its unequalled range of functions can provide the answer easily and quickly. Boost your productivity for £99.

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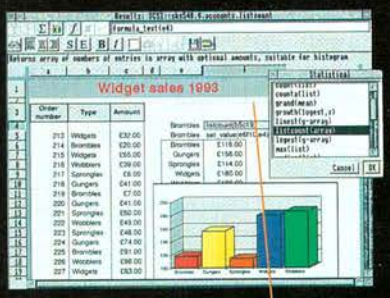
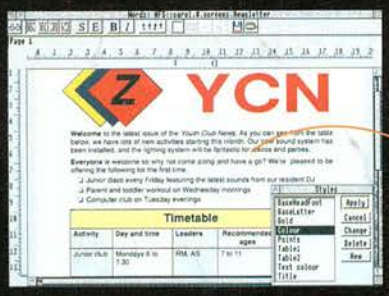
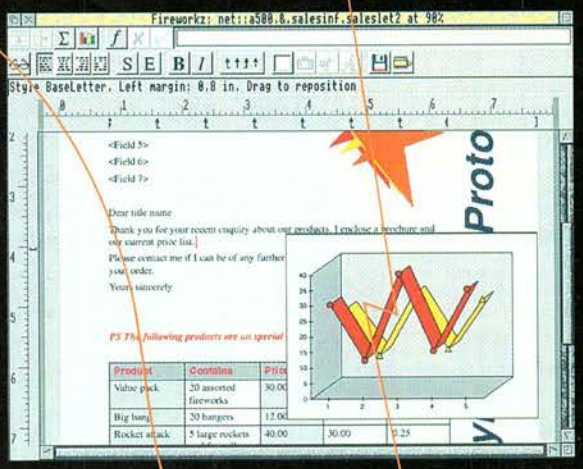


wordz



Wordz is the dedicated word processor, feature-packed but easy to use. Click on a button or drag an icon to design good-looking documents. Text and tables are easily styled, live on the page. At £79 it's the affordable option for documents with impact.



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January issue – on sale 4 January 1994

ARMed to the teeth

Find out what it is that makes the ARM chip so special and why it drives your computer so fast. Plus we reveal the truth about the asynchronous ARM chip with an exclusive interview with Professor Steve Furber. Turn to Page 49.

REGULARS

Comment 15
Choosing a computer ought to be a simple matter, but even the experts don't know how to compare one with another.

News 17
All the latest news of products and events taking place in the fast-changing world of the Acorn computer.

Public Domain 41
Teri Paul is back again with her pick of public domain and shareware programs to enhance your computer.

TechForum 77
Are you an expert programmer? This new hints and tips series is just for you with ideas and algorithms to help you work.

Databay 96
Games gossip and up-to-the-minute news picked up by HAL, our electronic ear to the ground.

Graphics 112
Mike Goldberg's been in combat with mortals ...and decides to investigate the art of effective cartoon graphics.

Problem Solved 115
Our technical editor opens his mail and shares the secrets behind some of those tricky hardware problems.

Body Building 116
Mike Cook takes a break from his telescope to build a computer-aided xylophone – or is it a glockenspiel?

Letters 120
This is your opportunity to voice your news, ideas and views on everything in the Acorn world from viruses to joysticks.

FEATURES

MegaDisk 4
Check out what's in store for you this month on the two best cover disks available for the Acorn 32-bit range.

BBC Disk 8
Full details on what's on the subscription disk for the 8-bit BBC Micro this month, and how to use it.

CD-Rom Competition 31
Join the CD-rom revolution and get yourself plugged in, courtesy of Morley Electronics and Acorn Computing.

ARM Powered 49
In this major feature we explain the power of the ARM chip its history and its future in a clear and interesting way.

The Acorn Family 59
We summarise the entire range of existing Acorn machines and explain how each is suited to its tasks.

Virtual Golf 64
Have a round on your nearest golf course, it's only as far as your Acorn computer.

Christmas Project 67
Why not use your 32-bit Acorn computer to design your Christmas boxes, cards and gift tags?

Naked Video 72
It's about time that Acorn machines broke into the real video arena, and now they have the Aladin Octopus.

Acorn Competition 79
Win a 2Mb Acorn A3010 with monitor and lots of software with this great contest.

Newcomers 100
Customise your computer to load just those programs and documents that you want.

REVIEWS

Learning Curve 33
We survey the latest in educational software for the Acorn computers:
- Alpha Sound
- Pictogram
- Word Library
- Sound and Rhymes

Shorts 45
Some of the smaller utilities that you can buy are put to the test:
- RISC OS 3: First Steps
- Card Shop
- Knowledge Organiser
- Mummy

Screenplay 81
All systems go as we look at the latest for 8 and 32-bit Acorn machines:
- Warlocks
- Haunted House
- Magic Pockets
- Small

THE MEGADISKS

Britain's best Acorn coverdisks contain hours of fun and a host of useful utilities linked to our editorial features to make the magazine come alive on your desktop! Full details about the packed Megadisks – see Page 4.

- **Warlocks**
  A race against time in this exciting arcade adventure
- **Resultz**
  Try out the capabilities of this powerful spreadsheet
- **Flossy the frog**
  A superb educational package to stretch the imagination
- **Christmas clipart**
  Lots of useful art work to help with our seasonal project
- **Databay**
  Pick up cheats for some of your favourite games
- **Graphics**
  Mike Goldberg's leap into kombative animation
- **Techforum**
  Our disk-based technical area for programmers

Subscribe now! – See page 29

SUBSCRIBE to *Acorn Computing* and you'll get an amazing value-for-money deal that beats all our rivals: Not only do you get a whole years-worth of issues for LESS than any other Acorn magazine, 32-bit owners get TWO disks every month.

See Page 29 for details of this superboffer.

If you have a BBC Micro, *Acorn Computing* is the only newsstand magazine that still supports you. Every month we have complete programs written specially for you and your computer.

To subscribe, turn to Page 29 now.

GET YOUR NEWSAGENT TO RESERVE A COPY NOW – SEE PAGE 28

The MegaDisks

MegaDisk 1

- Christmas Project
- Flossy the Frog
- Graphix
- !System
- TechForum
- The Heap

MegaDisk 2

- Body Building
- Databay
- Resultz
- Solver
- Warlocks

Resultz: Spreading the data

THIS demonstration copy comes from Colton Software (0223 311881) and you will need 2Mb of ram to use it but it works on both RISC OS 2 and 3. To get an empty machine hold down Shift+Control+Break.

RISC OS 2 owners will have to load the Squash module – just double-click on it before you load Resultz or add it to the modules in your !System directory.

In the sub-directories there are some example files which you can load, edit or change their layout as you will. You can't save or print anything with this program – for that you'll need the full version which costs £119.

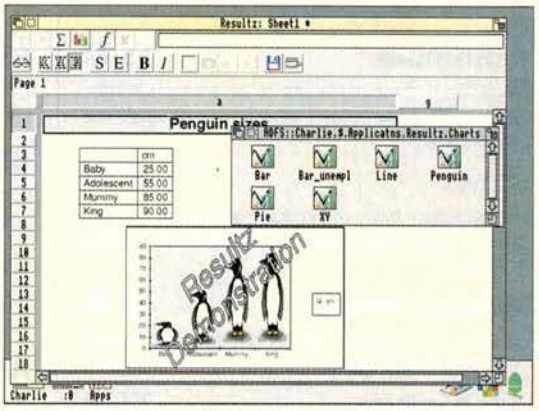
Resultz is a spreadsheet program with many functions and smooth background recalculation. In addition, unlike any other spreadsheet that we know of it is completely WYSIWYG, showing pages on screen exactly as they will be printed.

The button bar enables you to work on documents with a single click of the mouse, while the status line gives continuous information about the document.

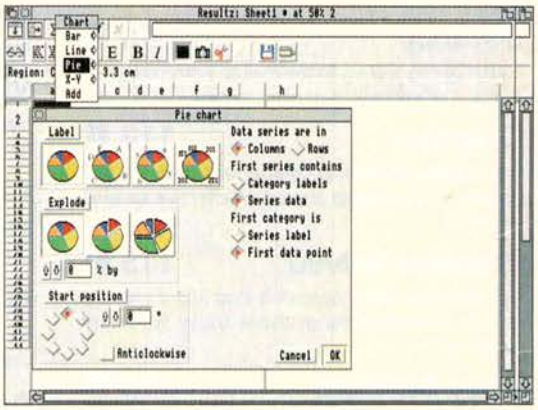
Resultz is part of the Fireworkz family which aims to provide the power needed to get your work done easily and produce great looking documents with the minimum of effort. What is more, they integrate, as all Fireworkz programs understand each other's files and load them immediately without fuss.

If you have used Wordz you should be instantly at home with Resultz. The user interface, page layout and style systems are identical and all of the documents created in Wordz can be loaded into Resultz.

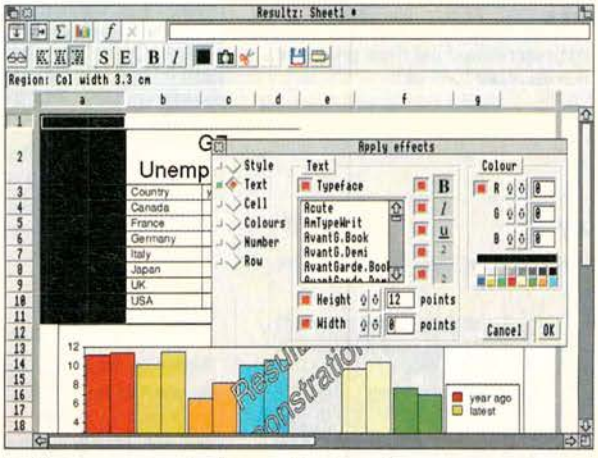
If you have used PipeDream you will find the formula syntax familiar. However, if you are new to spreadsheets the full version of Resultz comes with three books including the Resultz Tutorial Guide to take you through the package in easy stages.



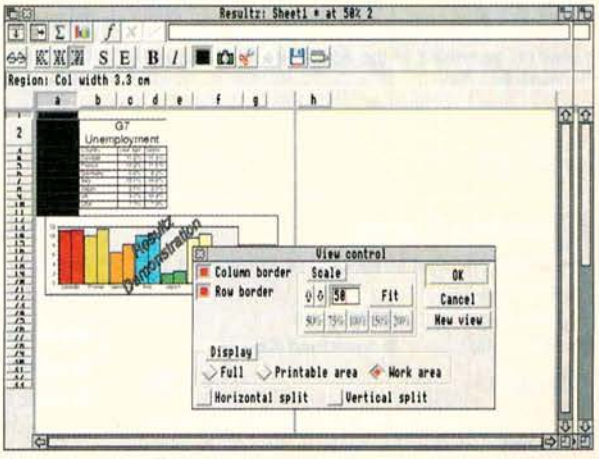
● *Resultz comes with a selection of files with which you can experiment*



● *You can always display your data in various forms or charts*



● *You can customise the text for best effect ...*



● *...or opt for different views*

● *MegaDisk 1 displays Acorn Computing's unique and easy to use menuing system*

● *To load MegaDisk 2 just drag the archive file on to the Menu on the iconbar*

● *To find out more about a program click on it once with Select and then click on the Help button*

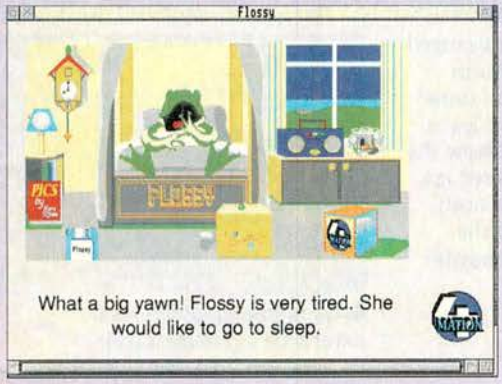
Flossy the Frog: Amphibian's adventure

THIS new educational adventure from 4Mation (0271 25353) normally costs £28.79 inc VAT, but this very special version is yours free on this month's MegaDisk. Instead of the different locations to visit and explore, you are invited into Flossy's bedroom to play with her toys and discover where the mouse lives.

You will need 2Mb of ram to run this program but it will work happily on RISC OS 2 and 3. Ideal for children from 3 to 7 years it covers the language element of the National Curriculum Key Stage 1.

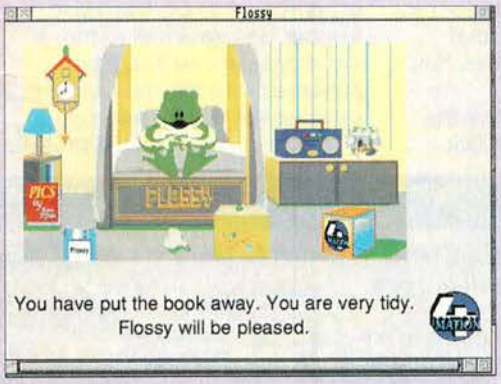
For full instructions click on the picture of the disk on the floor of Flossy's bedroom. As you click your mouse on different elements in the picture they will animate or show you something. But Flossy is tired and wants to go to sleep, what do you need to do to help?

The iconbar menu will let you change the font or size of the text. You can also opt for a full-screen mode if you prefer this to the multi-tasking window. Little adult supervision is needed as Flossy is equally at home in your house or school.

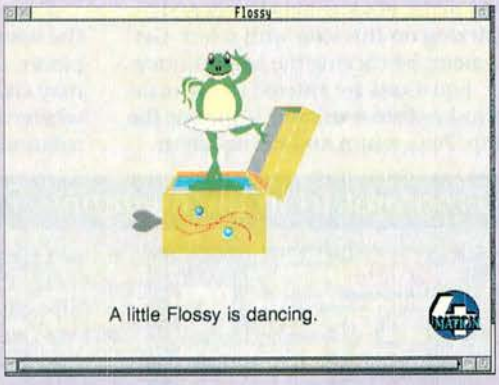


● *Can you work out what to do so she can sleep?*

● *Use the Adjust button to find out about each item*



● *Flossy is sleeping soundly, but you can still explore*



● *Use Select to activate all sorts of unusual toys*

FAULTY DISK?

If either of your cover disks has a physical fault – doughnut won't rotate in the sleeve, disk errors and so on – please return it for replacement to:

PC Wise Ltd
Dowlais Top
Business Park
Dowlais
Merthyr Tydfil
Mid Glamorgan
CF48 2YY

If there seems to be a fault with one of the programs please contact us by post describing your machine set-up and exactly what happens when you run the program.

Getting started with the MegaDisks

THE programs on these disks are stored in a highly compressed format which sometimes enables as much as 1.6Mb of programs and data to be stored on a 800k floppy disk

The procedure for running the programs is very straightforward and does not require learning any special methods or techniques.

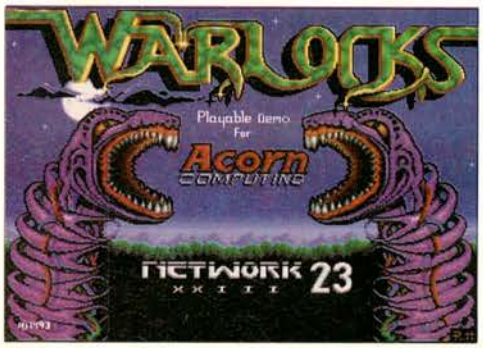
Switch on your Acorn micro, put the disk in the drive and click the drive icon. Now double-click !ACmenu – there's a short pause while it scans the archive then it displays a window of the contents.

You can treat this new window like any other one for viewing disk contents, you can run programs and open directories by double-clicking them.

Large programs must be unpacked by dragging on to a separate disk before being run. Some may have an !Install program that will do it for you.

We recommend that you always read the !ReadMe files or access the help information via the Help button.

Warlocks: Dare to do battle



● *This special version of Warlocks is ready and waiting*

● *Get out of the graveyard as quickly as possible*

THIS is a new game from a new company, Network 23 (0983 290347) and you can see the full version reviewed in this issue. Exclusive to readers of *Acorn Computing* comes this special challenge version. The full version costs £29.99.

The level to play has been written specially and is not in the full game. What is more, there is a one minute time limit. Fail and you'll be returned to the title screen – though you may return to this world of dungeons and dragons, magic and adventure again and again.

You will have to battle with demons, ghouls and goblins through fierce storms and over a treacherous landscape to lift the veil of darkness and evil cast by the Warlocks.

Help in your quest is provided by water spouts propelling you to new battles. Remember, this version is against the clock – only stop to fight when your life is in danger.

Controls:

Z	Move left
X	Move right
'	Jump/climb ladder
/	Crouch/descend ladder
P	Pause/unpause
Return	Fire crossbow

Don't miss the extras!

ACORN COMPUTING is selling like mad these days, so why not subscribe and make sure of your copy. And if you have a 32-bit machine you get an extra bonus – two super disks every month.

Solver: The right solution

THIS small multi-tasking application takes a quadratic equation, rearranges it, and finds its solutions. A quadratic is an equation which has a highest power of 2. In other words, terms can be squared but not cubed and so on. For example:

```
3x† + 5x - 6 = 0
```

Solver is used in the standard RISC OS way. Double-click on the icon from a Filer window as normal. The icon will appear on the iconbar, and the main window may be opened by clicking on this icon with select. Get a menu by clicking the Menu button.

Equations are entered In the main window into a writable icon near the top. Press return and the equation will appear in the window rearranged with two solutions at the bottom.

To enter the equation, you must use x2 for squared terms and leave no spaces. Two examples of how the above equation may be entered are 3x2+5x-6=0 and 3x2+5x=-6. Both would be rearranged to give the same result. The equations may be quite complex, for instance

```
5x2-4x+3x-4=6x2+9x-2x2+4-3
```

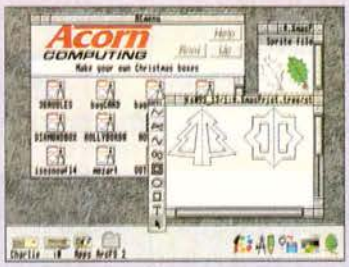
is quite acceptable.

Solver will display the solutions to the whole number, two decimal places, or seven decimal places. You may change this option whenever you like – even after the solutions have been given. Click with menu either over the main window or over the icon on the iconbar, and go across to the *Accuracy* submenu.You'll be presented with the choice, the tick showing the current setting.

● *Quadratic equations need never pose a problem again*

David Bradshaw

Programs from the magazine



● *Follow Steve Bruntlett's Christmas Project or design your own boxes and cards*

- Hal's Hacker cheats for: Blood Sport, Fervour, FRED, Gribbly's Day Out, HeroQuest, Paradroid and StuntRacer
- Mike Goldberg's programs for 32-bit graphics users for November, December and the Special issues
- TechForum helps solve the drag sprite module problem
- Library routines to allow BASIC programmers to use the heap module effectively
- A special seasonal body building program so your Acorn can play Maestro tunes on a glockenspiel
- Sprite and drawfiles to let you design your own Christmas decorations and gift ideas

● *Mike Cook follows the festive theme to play computer controlled tunes*

The Crystal Maze is a Chatsworth Television production
for Channel 4 based on ideas by Jacques Antoine © 1990

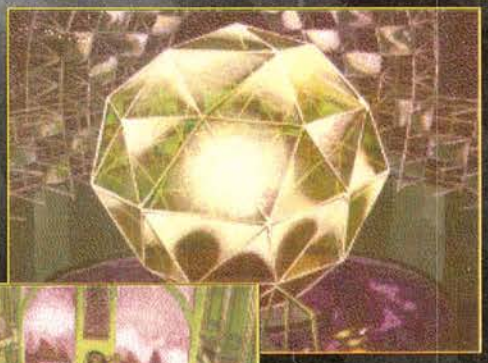
THE CRYSTAL MAZE

The Crystal Maze is available exclusively for Acorn 32 bit computers
AVAILABLE NOW
from Sherston Software or your local Acorn supplier.

'The Crystal Maze is a must for everyone from lovers of mind-bending puzzles to joystick -frenzy enthusiasts'
Acorn Computing October 1993

Into the Aztec zone.....

The final challenge!



Now you can play TV's No.1 Adventure Game

Try your hand at a game of skill ....

The Ocean zone contains new challenges ....

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Fax 0666 840048

Please send me ___ copy of The Crystal Maze® at £39.95 inc VAT

Name _____
Address _____
_____
_____ Post Code _____

Visa/Access: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Exp. Date: ☐☐☐☐
Signed _____

Don't miss out on the great programs for the Acorn 8-bit machines that you can receive every month. From software written specially for *Acorn Computing* readers to an excellent selection of PD programs.

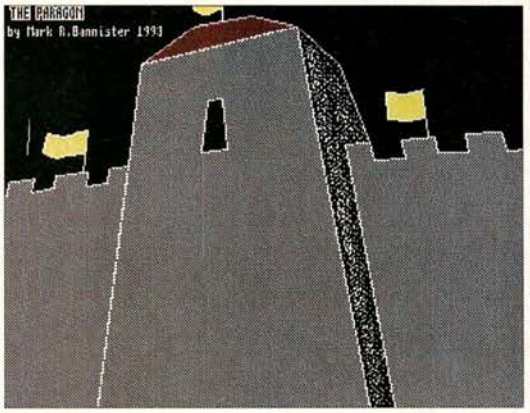
Subscribe now, turn to Page 28

The Paragon: A perfect nightmare...

THIS is a little game I wrote that turned out to be considerably more than originally intended. Not only does it demonstrate how simple ideas can turn into quite difficult puzzles, but the Master version also demonstrates how, with just a little extra thought, presentation can be boosted.

I must apologise that I couldn't find enough room for flashy title sequences on the Model B. The idea is to gain score by collecting as many coins as possible while escaping the clutches of the hovering robot guard-like things.

This is a one or two player game, and each player's score and number of lives left is displayed at the bottom of the screen (player one left) while the amount of energy you have is indicated by the length of the bar directly above the player's score.



● *Collect the coins and escape the guards*

If you crash into the hover-droids you lose some energy. You lose a life when that energy reaches zero. If you are playing the two player game, you may not play again until the other player dies or reaches the next level.

To complete a level collect the key and enter the chute – the trap door with the lightning bolt across it. Simple eh?

Water can be blue or yellow and when in it you float (what a surprise). If you remain submerged for more than 15 seconds you will drown.

Acid is lethal to the very touch, you sink in it and it can be red or magenta. One of the guards will give chase and you must be rid of him before you can complete the level. Do this by submerging him in water for 30 seconds.

On a Model B you must enter the filename of a set of four screens to load first. Two sets of screens are available, the first of which is called *Origins*. This is loaded automatically on the Master and can be played by pressing G. The other set of four screens has the filename *Tricky*.

The keys are as follows:

	Player One	Player Two (optional)
Left	Z	.
Right	X	/
Up	F	]
Down	C	Shift
Jump	G	Return
Suicide	1	0

Look out on the subscription disk next month for the Paragon Screens designer and another set of four screens to battle it out on.

Mark R. Bannister

Empire: Raising a bit of dust

Lieutenant Jones, known as Jugular to his (surviving) enemies, is being briefed by Admiral Costner:

"The situation is this, Jones, the Hegemony of the Empire is being threatened. Many worlds now under our control resent being ruled from Earth." The Admiral sneered: "They say they want freedom.

"They sent a delegation to discuss terms of self-rule ... we sent them back corpses." the Admiral's smile was mirrored by Jugular's own. "Naval Intelligence tells us 32 worlds are at the head of the insurrection. We want you to teleport into range of each planet in turn and destroy their defences as they are launched on you – thus cowering them.

"We are giving you a class B destroyer with fast rocket armament (FRA) – compared with their offensive rockets yours will be a blur of speed."

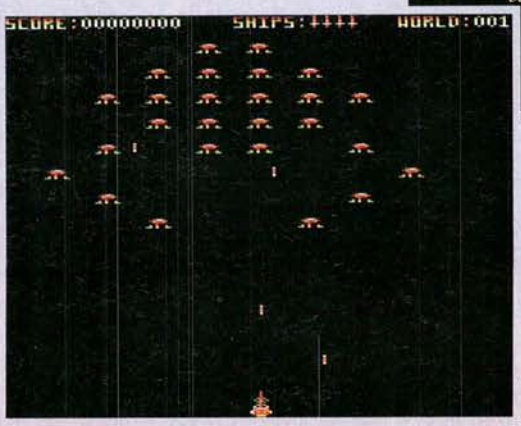
Jugular may think he will crush the worlds easily – but even now the rebel scientists, working for their beliefs and their lives, are perfecting new and faster ships – worlds above 15 and above 31 will each show an increase in offensive power. He, no, YOU must beware.

Left	Z
Right	X
Fire	Return
Sound off	Q
Sound on	S

Of course, you could just say it's a Space Invaders-style game and leave it at that. Except for the fact that your missile travels instantaneously from ship to target, whereas the bombs dropped by your opponents take much longer to arrive.

Paul Hallam

● *You are the bad guy in this one*



● *Instant missiles give you the edge*

Wanna sell some software?

Acorn Computing – the only newsstand magazine continuing to support your BBC Micro/Electron – is always on the lookout for good quality software to feature on the 8-bit subscription disk.

If you think your program has got what it takes just send it on disk to:

BBC Disk Submissions, Acorn Computing, Europa House, Adlington Park, Macclesfield SK10 4NP.

Don't forget to include a declaration stating the material is:

- All your own work
- Has not been submitted elsewhere
- We have your permission to use it

FOR ADFS ONLY

Zen & Menutation: the art of organising hundreds of files

I AM someone who collects tons of games from magazines and books (and some of my own) but knowing which of the million disks one particular game is on has to be a chore reserved for those people with one-way tickets to hell.

I'm not saying that this utility will assure you a place in heaven (it takes a lot more than that!), but it will cut down the number of disks your computer is covered with.

This quick and efficient menu system for ADFS works in Mode 0 and allows 78 programs per menu, all displayed on the screen at one time.

So let's cut the waffle and the niceties (I'm sure that's a bit like cutting a cake) and get down to business.

First, load and run the program called MENSYS which will set up an ADFS disk with the correct menu directory, !BOOT file and DATA file. This will then automatically run MENADD, the program which should from now on be used for altering the menu. The keys are as follows:

T	To change file type – CHAIN, *RUN, *EXEC, *TYPE, *LIST
Right arrow	For a new filename
Left arrow	To change the loading address (or entry screen mode if *EXEC,*TYPE or *LIST)
A	For a new menu name (25 characters maximum)
Copy	To insert an option
Control+Delete	To delete an option
Control+S	To sort into alphabetical order
Shift+letter	To jump to programs beginning with that letter
Up arrow	Go up list
Down arrow	Go down list
Shift+Up/Down	Move page
Control+Up/Down	Go to start/end
Control+P	Print data
Control+X	Save and exit, or just exit

Before you can do Shift+Break to auto-boot, transfer the file called MENU to the directory which was created by MENSYS. Now press Shift+Break to run your new menu.

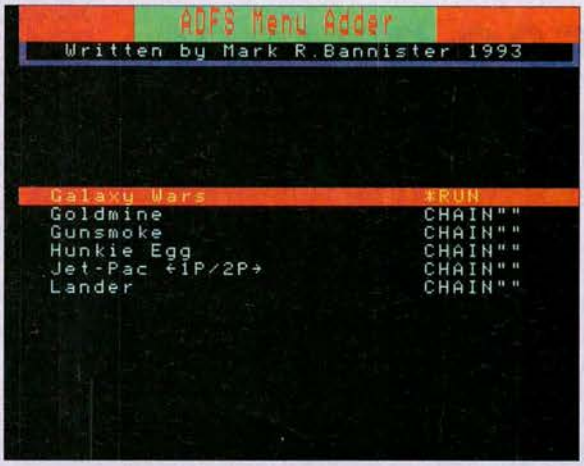
Using your newly created menu

The menu has a highlighted bar which you can move, using the arrow keys in all directions, until it is over the program you wish to run (or file you wish to view). Press Return to select.

If you have a joystick you could alternatively hold down the fire button, move the bar to your selection, and release to load.

I use this simple menu quite a lot. In fact I have a games disk that is absolutely full of *Micro User/Acorn Computing* type-in games that they have featured over the years. The best games I have were written by Gordon J. Key – I'm not surprised he's doing so well with the Archimedes now.

Mark R. Bannister



● *Use the menu system to add games*

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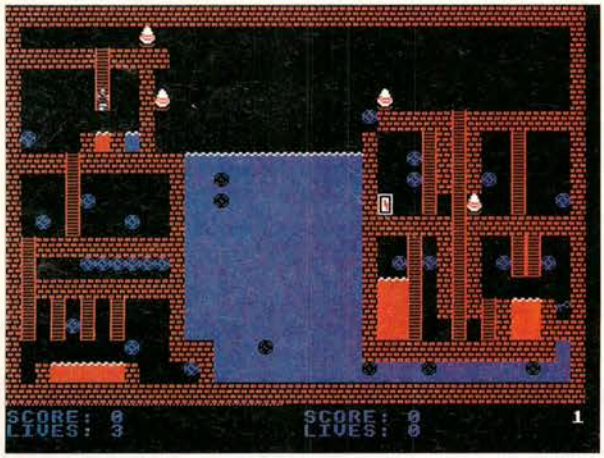
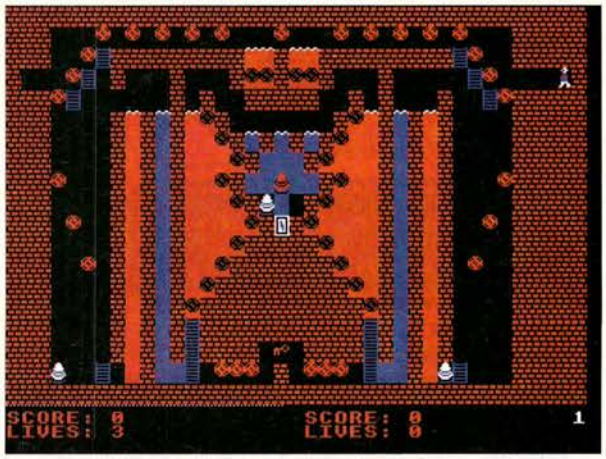


● *The Paragon present you with challenge...*



● *...after challenge*

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Real McCoy 2	Fourth Dim	£23
Real McCoy 3	Fourth Dim	£23
Real McCoy 4	Fourth Dim	£27
Recall, age 8-13	Sherston	£37
Redshift	Minerva	£10
RemoteFS Parallel Port	Atomwide	£50
Render Bender 2	Clares	£77
Rephorm	Oak	£47
Repton 3	Superior	£19
Resultz offer till Christmas	Colton	**£97**
– primary site licence, offer		£196
– secondary site licence, offer		£394
Revelation 1	Longman	£39
Revelation 2	Longman	£75
Revelation 2 CD Rom	Longman	£98
Revelation ImagePro	Longman	£127
Reversals	Chalksoft	£17
Rhapsody 2	Clares	£44
Rhapsody 3	Clares	£79
Rhythm-Bed	Clares	£38
RhythmBox II, age 8+	EMR	£34
RiscBASIC Compiler	Silicon	£77
RiscForth Compiler	Silicon	£72
RISC OS 3 First Steps	Dabs	V0 £15
RISC OS 3 Programmer's Reference Manual	Acorn	V0 £99
RISC OS Companion Vol 1	Oak	V0 £49
RISC OS Style Guide	Acorn	V0 £13
RoboLogo	Silicon	£38
Round the World Yacht Race, age 9+	Storm	£25
S		
Saloon Cars Deluxe	Fourth Dim	£25
– **Deluxe Extra Courses**		**£14**
S-Base 2 Developer	Longman	£193
S-Base 2 Personal	Longman	£119
S-Base Developer Plus	Longman	£255
S-Base Network	Longman	£275
Schedule	Acorn	£20
Schema	Clares	£95
Schema 2	Clares	£POA
Science, drawfiles	Micro Studio	£25
Score Draw	Clares	£44
Scorewriter PMS Desktop, age 12+	EMR	£147
ScreenPlay	Widgit	£35
ScreenTurtle version 2	Topologika	£45
Search and Rescue, age 9+	Storm	£27
Seashore Guide, drawfiles	Micro Studio	£16
Seelinks – Ourselves, KS1,2	ESM	£27
Seelinks – Pond Watch, KS2	ESM	£35
Seelinks – Tourism, KS3	ESM	£55
Seelinks – Transport, KS2	ESM	£35
Serenade	Clares	£106
Serpents	CIS	£POA
Settlement, KS3	ESM	£31
ShapeFX	Data Store	£10
ShareHolder	Silicon	£96
ShareHolder Professional	Silicon	£164
ShowPage	CC	£143
Shylock Gnomes, age 10-15	Selective	£16
Sim City	Krisalis	£22
Simon the Sorcerer	GamesWare	£31
SkyHunter	Longman	£22
Sleuth	RISC	£42
smArt	4mation	£50
smArt Aliens, Animals, Dinosaurs, Egypt, Europe†, Faces*, Fantasy, Fashion, Fiddles & Drums, Heraldry, Homes*, Leisure*, Look Smart, Smartoons, Trees and Gardens *English/French/German/Spanish/Welsh; †English/French/German; please specify each	4mation	£15
smArtFiler	4mation	£32
smArt Modern Languages	4mation	£19
Smudge the Spaniel, age 4-8	Storm	£20
Snippet (new version)	4mation	£32
Soapbox	Xavier	£34
SolidCAD	Silicon	£77
SolidsRender	Silicon	£77
SolidTools	Silicon	£204
– education price		£194
SongBook, age 3-10	EMR	£24
Sound Engineer, age 12+	EMR	£59
Sound-FX Maker	CIS	£POA
Sound-FX Maker & Photopia	CIS	£POA
Sounds & Rhymes	Xavier	£29
Spark	David Pilling	£5
SparkFS	David Pilling	£20
Sparkle	Morley	£59
Special	ICS	£10
– site licence		£30
Speech!	Superior	£18
Spelling week-by-week	Chalksoft	£20
Spex	ExpLAN	£98
Spheres of Chaos	Matt Black	£19
Splash, age 7-11	Sherston	£19
Splice	Ace	£34
Split an Image, age 7-16	Sherston	£16
Spoken Word	Wyddfa	£16
Spooler	Computer Tutorial	£9
Sporting Triangles	CDS	£19
SportsDay	Selective	£20
SportsPeople	Selective	£20
SpriteEd	Computer Tutorial	£17
SpySnatcher	Topologika	£12
Square Route	Computer Eyes	£16
Squirrel 2	Digital Services	£130
– site licence		£545
Squirrel C Developer's Toolkit	Digital Services	£96
Starspell Plus	Fisher-Marriott	£19
StartWrite	Icon	£55
StockPack	Topologika	£37
StoryBook, age 3-10	EMR	£59
StrongED	Stallion	£22
Studio24Plus Version 2, age 11+	EMR	£149
Studio24Plus Version 3, age 12+	EMR	£210
Stunt Racer 2000	Fourth	£25
SUMthing	Resource	£19
SuperDump	Silicon	£20
Superior Golf	Superior	£14
SuperPlot	Silicon	£20
Swiv	Krisalis	**£9**
T		
TABS	ExpLAN	£95
Talisman	Minerva	£8
Talking Pendown	Longman	£54
Talking Pictures	Wyddfa	£16
Talking Rhymes	Topologika	£37
Target Maths	Triple R	£15
Technodream (Nevryon 2)	Superior	£19
TechWriter	Icon	£159
Thinklink	Xavier	£29
ThinkSheet	Fisher-Marriott	£38
Thundermonk	Minerva	£11
Tiles	Brain Games	£16
Timeshare	Fisher-Marriott	£19
Timetabler	Minerva	£549
Time Traveller, KS2	ESM	£37
– Britain Since the 1930s, KS2		£30
– Expansion, Trade and Industry, KS3		£36
– Making of the United Kingdom,KS3		£36
– Medieval Realms, KS3		£36
– The Victorians, KS2		£30
TinyDraw/TinyPuzzle	Topologika	£34
TinyPuzzle	Topologika	£24
Titler	Clares	£115
Toolkit Plus	Clares	£36
Tools Graphics, drawfiles	Micro Studio	£23
Topographer	Clares	£61
Touch Type	Iota	£38
Tower of Babel	Cygnus	£17
Trace	David Pilling	£5
Tracer	Midnight	£46
Tracker	Leading Edge	£37
Transport, drawfiles	Micro Studio	£25
Turbo Type	CIS	£POA
Turbo Type, Sound-FX Maker, E-Numix	CIS	£POA

ICS

051-625 1006

Tween	Ace	£35
Twin World	UBI Soft	£14
TWO (Task and Window Organiser)	ICS	£10
– site licence		£30
TypeStudio	RISC	£38
U		
Utility Disc 1	Data Store	£8
Utility Disc 2	Data Store	£13
Utility Disc 3	Data Store	£7
Utility Collection	Data Store	£21
V		
Vector	4mation	£75
Victorians, age 7-11	Sherston	£POA
View»Mac 3	Human	£65
– Arc/Mac Cable	Human	£24
Viewpoints, age 7-11	Sherston	£37
Virtual Golf	Fourth Dim	£25
Visual Backup	Dabhand	£39
Vox Box	Clares	£44
W		
Waiter	Digital Services	£35
Waterloo (not OS 3.1)	Turcan	£19
Whale Facts	Topologika	£31
Wordbank	Topologika	£25
Words and Pictures	Chalksoft	£18
WordWorks	CC	£38
Wordz offer till Christmas	Colton	**£77**
– primary site licence, offer		£156
– secondary site licence, offer		£314
World Geography Maps, draw	Micro Studio	£23
WorldMaker, KS3,4	ESM	£51
World Map Study, KS3,4	ESM	£61
Worldscape	Leading Edge	£17
World Wildlife, sprites	Micro Studio	£16
Worra Battle	Oak	£15
WorraCAD	Oak	£79
X		
Xenon 2	GamesWare	£21
Y		
Yacht 2	Computer Tutorial	£49
Yacht 7	Computer Tutorial	£94
Z		
Zarch	Superior	£14
Zelanites (not OS 3)	Micro Power	£15
Zool	Gremlin	£19

HARDWARE

COMPUTERS . . .

A3010 Action Pack	Acorn	£335
A3010 Learning Curve System	Acorn	£599
A3020 FD System	Acorn	£650
A3020 HD60 System	Acorn	£775
A4 2M FD System	Acorn	£1350
A4 4M HD60 System	Acorn	£1650
A4 Battery Pack	Acorn	£53
A4 Shoulder Bag	Acorn	£37
A5000 2M HD80 Multiscan System	Acorn	£1225
Pocket Book	Acorn	£169
– Class Pack		£1599

PRINTERS . . .

ArcLaser 300-6	Calligraph	£895
ArcServer 300-8	Calligraph	£985
Bubble Jet BJ-10sx	Canon	£187
Bubble Jet BJ-10sx + TurboDriver	Canon/CC	£219
Bubble Jet BJ-230	Canon	£315
Bubble Jet BJ-300	Canon	£325
Bubble Jet BJ-330	Canon	£380
Bubble Jet BJC-600 + TurboDriver	Canon/CC	£535
Bubble Jet BJC-800 + TurboDriver	Canon/CC	£1374
DeskJet 510	Hewlett-Packard	£275
DeskJet 500C	Hewlett-Packard	£375
DeskJet 550C	Hewlett-Packard	**£455**
Laser Direct HiRes4 + Impression	CC	**£799**
– 250-sheet Paper Cassette		£99
Laser Direct HiRes8 + Impression	CC	**£1050**
Laser Direct HiRes Board	CC	£325
New toner cartridge for Canon LBP-4		£59
New toner cartridge for Canon LBP-8		£75

For ordering details please turn to page 3

ICS

051-625 1006

SCANNERS, DIGITISERS . . .

ArcScanner including Epson GT-4000	Clares	£1660
Colour Converter	Lindis	£145
Eagle M2	Wild Vision	£POA
FaxScan	Spacetech	£94
GreyHawk	Wild Visiion	£98
Handipad	TechSoft	£193
Hawk V9 MkII	Wild Vision	
– standard		£199
– hardware dithered		£259
HiVision Digitiser Colour	HCCS	
– A3000 External		£137
– A3000 Series / A4000 Internal		£124
– A5000 / 300 / 400		£124
iMage (Sharp JX-100)	Irlam	
– for A5000		£490
– for other computers		£589
Image Scanner	Iota	£383
– Colour Upgrade Kit	Iota	£239
– Fast Parallel Card	Iota	£98
i-Scan 200	Irlam	£539
i-Scan 400	Irlam	£589
Pineapple Colour Video Digitiser	Pineapple	£195
– A3000 boxed	Pineapple	£230
ProImage (Epson GT6000)	Irlam	
– for A5000		£989
– for other computers		£1089
Scan-Light A4	CC	£277
Scan-Light 256	CC	£185
– A3000 External	CC	£190
– A3000 internal	CC	£190
Scan-Light Professional	CC	£565
– as above + SCSI interface	CC	£699
Scan-Light Video	CC	£208
Spectra	RISC	
– A3000 Series / A4000 Internal		£545
– A3000 External		£555
– Archimedes / A5000		£545
Vision Digitiser	HCCS	
– A5000 / 300 / 400 Mono		£48
– A5000 / 300 / 400 Colour		£76
– A3000 External Mono		£60
– A3000 External Colour		£89
– A3000 Series /A4000 Internal Mono		£48
– A3000 Series / A4000 Internal Colour		£76

MISCELLANEOUS. . .

386 PC Expansion Card 25 MHz	Aleph One	
– 1 Mb		£POA
– 4 Mb		£POA
486 PC Expansion Card	Aleph One	
– 1 Mb		£POA
– 4 Mb		£POA
4-slot 4-layer Backplane	IFEL	£52
5315 Monitor	Aydin	£425
A300/400 Fan kit	ICS	£15
A3000 Expansion Box	Wild Vision	£135
A310 RISC OS Carrier Board ‡	IFEL	£18
A5000 Fitting Kit for second hard disc	ICS	£15
A5000 105 Mb Removable Disc Kit		£POA
– Extra 105 Mb Disc		£POA
AnDi Oddule	Baildon	£39
Arckey Function KeyStrip Holder	ICS	V0 £3
– pack of 4		V0 £10
ArcNET	ACS	£69
ARM3 ‡	Aleph One/IFEL	£165
Arm_Stick	Arm_Tech	£28
ColourBurst	State	£374
ColourCard Gold	Wild Vision	£225
– A3000 External	Wild Vision	£225
Dongle Dangle with screw fittings	ICS	£6
Ergo-keyboard	Castle	£99
Fan filters (pack of 10) (not A5000)	ICS	£6
FaxPack	CC	£289
Floating Point Accelerator (A5000 + A540)	Acorn	£93
Floppy Discs, 10 × 3½" High Density		£10
G16 True Colour Card	State	£258
G8 Plus Accelerator	State	£238
HiPoint Mouse for A4	Genius	£49
I²C Adaptor	Baildon	£10
I²C SWI (enhanced IIC_Control)	Baildon	£15
– bought with AnDi Oddule		£5
Microlin fx Pocket Fax Modem	Pace	£179
Micro Mouse	Clares	£26
Monitor Stand for A3000	ICS	£21
Mono/SCSI	Atomwide	£48
Podule Case for A3000	HCCS	£16
Power Pad (Dual)	GamesWare	£34
Power Pad (Single)	GamesWare	£25
Printer Port Sampler	Leading Edge	£42
Printer/SCSI	Atomwide	£74
Publishing Pack	CC	£475
Revolution CD-ROM	Morley	£295
Revolution Pro (for SCSI system)	Morley	£435
RISC OS 3 Upgrade	Acorn	£75
Seal 'n Type spill-proof Keyboard Covers		
– Archimedes / A5000	Kador	£14
– A3000	Kador	£14
TouchWindow	Lindis	£234
Whisper Fan Quietener (for A300/A400 series only)	ICS	£15
Wizzo IDE Filing System on rom	ICS	
– Wizzo4 for A4		£POA
– Wizzo5 for A5000		£39

MEMORY . . .

Fitting extra unless otherwise stated
† Fitting fairly easy ‡ Fitting needs expertise

A3000 2 Mb Upgradable †	Atomwide/IFEL	£58
A3000 4 Mb †	Atomwide/IFEL	£120
A3010 1-2 Mb		£39
A3020 / A4000 2-4 Mb †	IFEL	£POA
A310 2 Mb Upgradable soldered ‡	IFEL	£94
– as above + MEMC1a		£119
– as above + MEMC1a + fitting		£149
A310 4 Mb soldered + MEMC1a ‡	IFEL	£159
– as above + fitting		£189
A4000 2-4 Mb	Simtec	£80
A5000 2-4 Mb †	Atomwide	£85
A5000 2-8 Mb including fitting	Atomwide	£500
A5000 4-8 Mb including fitting	Atomwide	£391
A540 4 Mb †	Acorn	£238

Do you use an A5000?
need to back-up data quickly?
need to carry data from one computer to another?
wish you could lock important data away easily?

Could you use 105 Mb floppy discs?

We've got some. They should really be called removable hard discs, but the difference is academic. Just install one of our SyQuest kits in your A5000 as though it were a second floppy disc drive. Now you can use 105 Mb removable discs as if they were fast floppies.

Removable discs cost about the same per megabyte as traditional floppies. Our complete package includes a drive, a fitting kit and one 105 Mb disc, formatted and tested. No soldering is required.

Each ICS kit also contains a special version of Wizzo - our own IDE filing system on rom. Acorn's filing system does not support removable hard discs (you would need to reset the machine every time you removed a disc).

Only Wizzo supports the SyQuest option.

WIZZO (it's magic)

And gives you disc partitions, password protection, and the ability to access more than 512 Mb of storage.

WIZZO SYQUEST COMPLETE PACKAGE £449
ADDITIONAL 105 MB DISCS £69 EACH

Wizzo5 owners: please return your rom in its original packaging and deduct £15.

HOW TO ORDER

VAT: Zero-rated items are marked V0. UK customers please add 17.5% to all other prices. EC customers outside the UK (including BFPO) please do the same unless you are VAT registered, in which case quote your international VAT number. Ours is GB 595 7258 84.

CARRIAGE IS FREE WITHIN MAINLAND UK IF YOU PAY ON ORDERING.

Overseas carriage: If you are paying by credit card we will add airmail and insurance at cost. Otherwise please add £6 (Europe) or at least £12 (elsewhere) for each software item and send a pounds sterling bank draft payable at a London clearing bank, or Eurocheques for not more than £100 each.

Credit cards are welcome. We do not charge your account until your order is fulfilled. Your name and address must be as known to the credit card company. If you are leaving an order on our answering machine please include your telephone number, the expiry date of your card, and your calculation of the total payment due. We will make no charge for credit card commission unless we have informed you first.

Official orders are welcome from UK government and educational institutions. Payment is due in 14 days. Invoices are subject to carriage and late payment charges.

Site licences are available for most products. Please check our prices.

All products, prices and specifications are offered in good faith and are subject to change without notice. We process all orders immediately, but suppliers do sometimes keep us waiting. Goods are guaranteed but we do not supply them on approval. Returns and cancellations can only be accepted by prior agreement and there may be a charge to cover the costs involved.

AUTHORISED ACORN DEALER

ICS (Ian Copestake Limited)

Dept AC16, 1 Kington road, WIRRAL, Merseyside, L48 5ET

Tel: 051-625 1006 Fax: 051-625 1007

E&OE D61 931113

LICENSED CREDIT BROKER

Value judgements

MY computer does more MIPS than yours does, naa naa ny-ah na! Well, my computer's got more software than yours! I can play better games on mine! Mine's got a 590Mb hard disk! Mine's doesn't need a big hard disk 'cos the applications are smaller! Mine's got bigger numbers in its name!

You might as well be back in the playground when owners of competing computer systems get together. Human beings just can't seem to get the concept of competition out of their heads – c'est la vie.

But when it comes to comparing computers how do you do it? Is there any practical method? Is it even a good idea? Well, of course it is, after all it's a fundamental activity of intelligence. But *what* criteria can you use to find out which one's best?

In the past the magazine *Personal Computer World* developed a whole series of *benchtests* that measured things like speed of screen drawing, disk accessing time, processor power in terms of time to perform different types of calculation.

All this was very interesting and you could produce lots of pretty graphs and comparison tables and all sorts of information could be drawn from it ... whether true or not.

However, one of the things that benchmarks were really good for was controversy. Endless letters about the rightness and wrongness of them, learned dissertations about how the information was not really accurate because ... and so on.

PCW did their best and had the benchmarks redesigned by statisticians, but it was hopeless and eventually their multiple system benchmark test was dropped. At present they use a standardised test set that measures not only raw processor and hardware performance but also performance when doing a number of standard set tasks using popular software.

But these Euro Test Labs benchtests have one serious flaw: They only apply to PC-compatibles because the *popular software* is only available for PCs. Acorn, Apple, Atari and Commodore machines don't have versions of dBase or Microsoft Word and they can't run a Windows 3.0 application written in Visual BASIC – so they can't be compared.

This is entirely fair of course ... but it's not a lot of use since it only compares PCs with other PCs.

However it is a step in the right direction because it does recognise the fact that it's the *use* that a computer is put to that's the single overriding judgement on its value. Or is it?

You could *use* a Psion Series 3 as a typing tutor given the appropriate software, but with that tiny keyboard it's not really practical. You could *use* a PC to display Full Motion Video, but given a completely free choice with no pre-conceptions it's not the best option.

The value of a computer system must be judged on its *usability* for a given application or applications. And being objective about any computer system, and its usability, is at the very least hard if not downright impossible. Because *usability* is such a subjective word.

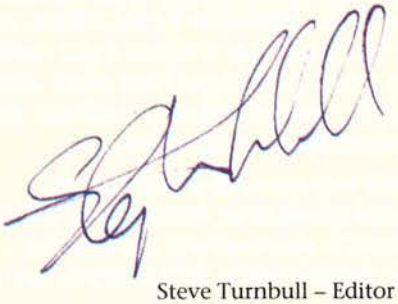
I find Impression to be exceedingly usable for all sorts of writing and DTP but then I've been using it daily for five years. Someone who's been using Ovation every day since it was released would probably feel the same.

Where you're comparing like with like, using the Euro Test Labs benchtest on PCs, there's no problem, any given PC is simply faster or slower in one or other part of the test, but if you give one of these machines to a user it's just another PC – objectivity is easy because *usability* in this context is directly related to speed.

But step outside the bounds of a single type of computer and instantly you're in the realms of subjectivity. The fact is that every PC-user who has been given an opportunity to learn and use an Acorn machine for more than just a couple of minutes, has been impressed by its speed and usability. But it's subjective because the tasks cannot be directly compared.

So if you want to show the other kids in the playground that your toy's better you're just going to have to hand it over and let them play with it because the only way they'll find out is by subjective experience.

Is there any way of deciding which computer is a best buy? Steve Turnbull investigates



Steve Turnbull – Editor

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ICS WIZZO (it's magic)

051-625 1006

The ideA range

ICS was the first company to offer IDE products for Acorns back in 1990; now they are the standard choice for new Acorn computers. Building on three years' experience we have continually improved our IDE filing system. It now offers the highest level of RISC OS compliance, and compatibility with at least 45 different hard discs tested by us. Can any other supplier make this claim?

Our IDEFS abolishes the RISC OS limit of 512 Mb, and offers extra features such as password protection, background operation, disc partitioning, and power saving (which allows some discs to stop spinning when idle).

Partitions can have different levels of protection. Family or pupils can access some of your files while you keep others safely out of their reach. Or you can simply protect the whole disc (reformatting is not required for this).

Our hard disc upgrade kits are based around two internal interfaces at present: IDEA3IN for the A3000 Series, and IDEARCIN for the A300/A400/A500 Series. All kits are designed to a high standard and include all the parts you will need.

IDEA3IN upgrade kits include an I²C expansion socket as standard. They come with a 2½" disc already attached, and are easy to fit once you have opened up your computer. You may safely take no notice of rumours still being spread that internal upgrades might not be safe in an A3000. We have adhered carefully to the guidelines in Acorn's technical specifications, and in three years have never come across a problem.

IDEARCIN upgrade kits provide a fast 16-bit link all the way from the computer to the hard disc. They can even be fitted to an A310 without a backplane – quite a cost saving. A second hard disc can easily be added later if required.

Interfaces and hard discs can also be bought separately. By shopping around you may even save a few pounds. But beware: not all IDE hard discs work with all interfaces, and if you have a problem it may be difficult to decide who should put it right. We recommend buying a complete kit from one source.

WIZZO is the name given to our IDE filing system when it is supplied as a single rom chip. Wizzo5 is for the A5000, and Wizzo4 is for the A4. You should buy a Wizzo if you need password protection or wish to use larger hard discs. (Wizzo4 has been delayed slightly – we are adding a feature to ensure compatibility with possible future A4 upgrades).

A Wizzo rom by itself will only produce a slight speed improvement. If you need speed in an A5000, fit an IDEARCIN interface instead. Up to 60% improvement can then be achieved, but this does depend which hard disc you use so do check with us first.

How to read our ideA product references

A number at the end is the nominal hard disc capacity in megabytes. We usually round this down, so the actual formatted capacity may be higher. All discs have auto-parking. Average access times vary but all are below 20 ms.

All prices shown exclude VAT and are subject to change without notice. The cost to us for hard discs can vary enormously from week to week – not always downwards! Your local dealer can obtain *ideA* products from us or from a distributor.

◗ Archimedes A300/A400/A500 Series Internal Upgrades

Package includes formatted hard disc, ideA interface card, hard disc cradle and fittings, fan kit, replacement multi-purpose LED (power and drive status), manual with fitting instructions. Can be fitted to an A310 without a backplane. If a backplane is used it must be a 4-layer type. Easily fitted by most users.

IDEARCIN 40*	£175	IDEARCIN 330	£399
IDEARCIN 80*	£205	IDEARCIN 420	£499
IDEARCIN 170	£275	IDEARCIN 540	£650
IDEARCIN 240	£325	IDEARCIN 1000	£925

◗ A3000 Series Fully Internal Upgrades

Package includes formatted hard disc mounted on ideA interface card, manual with fitting instructions. Fully internal, using internal expansion slot. Co-exists with floppy drive and memory upgrades. Fits the new 1992 computers. Easily fitted subject to Acorn warranty stipulations.

IDEA3IN 40	£175
IDEA3IN 80	£250
IDEA3IN 120	£299
A3000 FAN KIT (not usually required*)	£19

**Only required if the computer has been fully upgraded, e.g. with maximum memory AND Econet AND an external podule.*

◗ Separates for hard disc upgrades

We can only guarantee the performance of ideA interface cards with hard discs we have tested ourselves, so please check if in doubt. If you are buying a hard disc for an A5000 please say so. If you intend to fit the disc in addition to an existing one we need to know the make and model of the existing disc. Acorn's interface does not support all makes of disc, and some models will work as a second disc but not on their own.

Hard discs on their own are listed as, for example, IDEA 80. An S at the end indicates a 2½" disc.

IDEARCIN (Archimedes Interface for Internal disc(s))	£60
IDEA3IN (A3000 Interface for Internal disc)	£75
ARCHIMEDES INTERNAL CRADLE KIT	£15
ARCHIMEDES A300 / A400 SERIES FAN KIT	£15
4-SLOT 4-LAYER BACKPLANE	£52
POWER CABLE FOR SECOND HARD DISC	£5
A5000 SECOND HARD DISC FITTING KIT	£15

IDEA40*	£125	IDEA330	£349
IDEA80*	£155	IDEA420	£449
IDEA170	£225	IDEA540	£600
IDEA240	£275	IDEA1000	£875

IDEA40S	£115
IDEA80S	£190
IDEA120S	£239

◗ WIZZO IDE Filing System on rom

Package includes rom, manual and fitting instructions. Compatible with RISC OS 3.0 and 3.1. Allows up to four logical partitions over two physical drives. Each partition appears separately on the icon bar and can have different password protection. Makes use of existing Acorn hardware for maximum compatibility, but works with a wider range of hard discs. Security breaches using ADFS can be prevented. Can be fitted easily by a competent user.

Available now: WIZZO5 for A5000	£39
Available soon: WIZZO4 for A4	POA

Quantity discounts available • Dealer enquiries welcome

** Lower-capacity 3½" discs are now very hard to obtain. Please check availability before ordering.*

ICS (Ian Copestake Limited), Dept AC16, 1 Kington road, WIRRAL, Merseyside, England, L48 5ET

ANT connection

STAFF of Atomwide and Aleph One have come together as ANT Ltd to supply the Ethernet network interfaces for the Acorn machines used in Acorn's new HQ in Histon.

Around 300 10BaseT (twisted pair cable) network interfaces were delivered and installed linking nearly every desk in the building. The interfaces were connected to central Ethernet hubs which route the network traffic around the three-storey building as well as over fibre-optic links to Acorn's two other sites in Cambridge.

There's word for it

CREATING word searches is useful for both leisure and educational purposes and Digital Phenomena (0705 871530) have created a new application called Word Search which allows you to create puzzles with a minimum of fuss for only £9.95.

Release two of GuardianPro is now available for £14.95. Digital Phenomena will upgrade earlier versions free and replace any other Acorn virus killer to GuardianPro for £6.99.

Art's sake

TEKOA Graphics (0788 571434) will put your graphics on T-shirts, sweatshirts or even on your coffee mug. You just send thedesign on disk in Draw, sprite or ArtWorks format. The maximum design size is 279mm x 215mm but there is no restriction on colour.

The garments are colourfast and washable while the coffee mugs have the design applied within the glaze so it resists normal wear and tear. One T-shirt will costs £13 but for 25 it comes down to £6 each. Coffee mug prices start at £6.

Master of music

TWO volumes of music trackers have been released by TMJ (0536 762713) for £12 each. Digital Masterpieces uses Desktop Tracker modules with a friendly user interface allowing play of one track continuously – or you can play through the entire volume.

Acorn unfair, says Commodore

COMMODORE UK cried foul when they saw the Acorn promotional video *The Home Computer Minefield* staring John Lesley. Commodore took an injunction out against Acorn when they saw their Amiga 1200 being literally *blown away*.

Commodore – who have just launched a 32-bit games console – felt that the video implied that their machine was just for games, couldn't supply education and business products, and that Acorn were *knocking* them.

Acorn were adamant that this was not their intention, but as Commodore felt so strongly Acorn volunteered to recall the video.

Acorn's Sales and Marketing Director Mike O'Riordan said:"The purpose of the video was always to guide the consumer through the process of purchasing a computer for the home. We believe the Acorn range is better for the home consumer, particularly in the home education area where we draw on our strength as the leading supplier to UK education."

10,000 videos have been despatched already and letters have been sent by Acorn to these people explaining the situation. Asked why Acorn didn't fight the complaint, Mike O'Riordan commented: "If you contest things in court only two people win – they're called lawyers and lawyers."

However, Commodore are not of the same mind and don't want to see the matter dropped. At the time of going to press the action continues and the case will be heard early in the New Year.

Commodore's action coincided with Phase II of Acorn's 1993 campaign which includes a new video acting as a detailed guide for parents on the educational use of computers. This will be sent free to everyone who responds to Acorn's home computer adverts.

Acorn World Update

Acorn World 93

Acorn put together an excellent show during the last weekend in October at Wembley, pleasing exhibitors, visitors and themselves – no mean feat. New products abounded, as we reported in our November issue, and other developments were given sneak previews.

The Acorn gallery sported the options available to Acorn for their new range of machines for sound, vision and look. The possible new look for Acorn machines was a very stylish *Black Beauty* look though the slanted keyboard may take a little getting used to. However, reports show that such a configuration should help prevent RSI – repetitive strain injury.

Acorn were adamant that this did not represent the definitive line-up of the next generation...

● *Replay files can now be wrapped round objects*

What they did launch at the show was a new high resolution Super VGA monitor from Microvitec. It will be bundled with all Acorn machines for an additional £75 on top of the normal Multiscan system price. You can buy it separately for £374 (inc VAT).

● *Acorn's new Super VGA monitor can be part of your package*

Acorn's Roger Wilson has been tweaking Replay over the last few months and this was the first public showing of some of the new features. Uniqueway (0222 644611) were also demonstrating the latest version of Empire, as well as Replay's ability to transform movies into a variety of 3D shapes from Acorns to rotating cubes.

The improvement to Empire mean that VIA files produced by the original Acorn Replay DIY kit are no longer supported for editing, as the format has now been included as an ARMovie file type. All future upgrades to Replay files will be automatically supported by Empire. Furthermore tracks can now be

➤

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Please add £1 per font p&p plus VAT

Acorn WORLD 93

annotated by drawfiles with text, graphics, charts and so on.

Uniqueway also have a series of utilities for Acorn Replay including !EmCvt which converts individual sprite files – or directories of sprites – as well as Clear files and other image types into ARMovies.

!Video enables Irlam's Moving-Image card to grab 12.5 fps movies without sound instead of using a Replay DIY card and !ToReplay which is a replacement for !ARPlayer.

!CDSampler takes the medium a stage further allowing you to sample data directly from CD drives over the SCSI bus. You can transfer any section of a track from an audio CD to a hard disk as raw data, a Microsoft WAVE sound file or an Acorn Replay file – for £15.

Wild Vision (091-519 1455) used the show to launch more details of their multimedia range. The Eagle M2 MultiMedia card was seen for the first time with the Talon interface which links the Eagle with other video expansion cards to produce professional video effects.

For instance, the Talon lets another card read the digital video data directly from the Eagle's framestore for further processing.

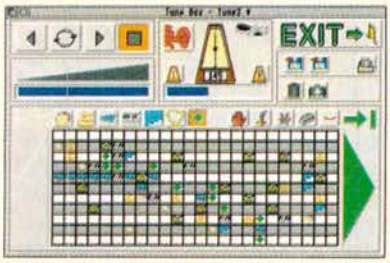
So if you connect the Chroma 500 digital genlock you can create video overlays mixing a second video source with the genlock's output and high resolution computer graphics.

Wild Vision continued its multimedia blitz with MIDIMax which is a single width expansion card providing a standalone MIDI solution for £69. The card holds a 16 byte memory for both transmission and reception so no data is lost even when the interface is transmitting at its maximum rate.

The common problem of translating a standard modulated TV signal into a format suitable for a computer is addressed by TV Buddy – a TV tuner in the form of an Acorn expansion card.

A socket on the back connects to the aerial and all the channel selection is done by software on the computer.

Wild Vision designed the card to provide a source of TV audio and video for digitising products such as the Eagle M2 and Hawk V9 MKII but it can be used anywhere TV is required as a video source.



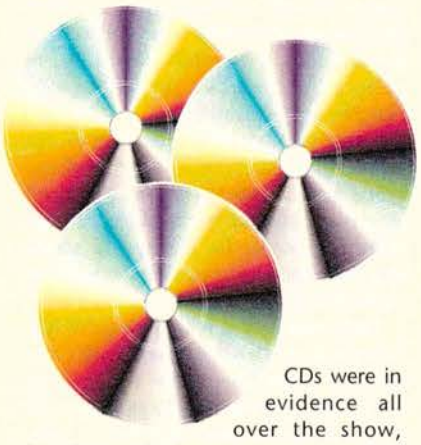
● *Compose music and sounds by ear*

Music was very much in evidence at the show with the launch of the Sibelius 7 music writing package from Sibelius Software (0223 302765).

For younger Acorn users Music Box from Topologika (0733 244682) is a suite of four programs aimed at the primary age range. No reading is involved and you can record creations to listen to or print so that tunes can be played on *real* instruments away from the computer.

Speech, pitch and key can all be changed and functions and tools can be configured to an individual child's needs.

ILP (0532 461528) launched the third of their new series of CD-rom titles: The Environment – Water. This combines over a 1,000 images with maps, audio, text and footage from the Yorkshire TV archives – all for £130. Early 1994 will see the release of the next title in the Environment series, Land and Air.



CDs were in evidence all over the show, though most had an education bias. RISC OS programmers were caught by Emerald Publishing's (0223 840138) Tekkie Disk CD. This contains the RISC OS 3 Programmer's Reference Manual, Desktop Development Environment user manual, ANSI C Release 4 and Assembler Release 2 user manuals, BBC BASIC reference manual and RISC OS 3 Style Guide – all for £99.

By its very nature you can access and search and the !Librarian lets you select pages, move backwards and forwards through page sequences as well as use indexes, contents and follow cross-references between books.

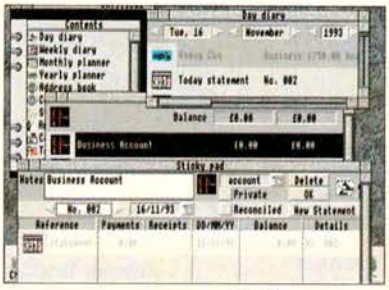
There is also a note-taking facility and the ability to place bookmarks. You can't, of course, print or download the text itself as this would breach copyright.

If your time and work could benefit from some management Almanac 3 was launched just in time. Stallion's (0225 339090) new version includes an accounts facility. You can use this to reconcile your bank statements. Entry is via a simple transaction record and information exported elsewhere if necessary.

The data integrates with other features so that a cheque will appear in the Accounts section and in the Diary. Statements are locked automatically once they have been reconciled and unreconciled items can be dragged into a new statement.

There was a selection of new products from Atomwide (0689 838852) such as RemoteFS which is a filing system that lets you manipulate files and directories on remote machines as if they were local regardless of whether machines are being connected by the serial port, parallel port or Ethernet or Econet network.

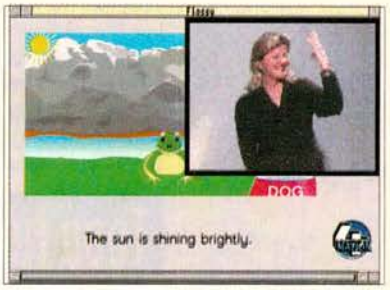
An ATS60 hand barcode reader was also in evidence using the latest CCD (Charge Couple Device) technology. This allows you to read high and low density barcodes even when they are not in pristine condition and whether produced on a dot matrix or laser printer. As the ATS60 connects via the serial port you need no extra hardware.



● *Almanac now does accounts as well*

Also on display was the Victron Pico UPS (Uninterruptable Power Supply) varying from a 250 VA max to 800 VA. A Pocket Ethernet Adaptor for A4, A3010, A3020, A4000 and A5000 was shown for attaching to the parallel printer port of these models. This is the first ethernet interface released for the A4 portable.

On the education front 4Mation (0271 25353) presented sneak previews of a sign language version of Flossy the Frog. This is being produced with Dr Jan Branson of La Trobe University in Victoria, Australia. The finished version will be a CD-rom Flossy using Replay to show a sign language video clip for each of the 300 pieces of text in the program.



● *Flossy the Frog plus sign language – a major advance*

This is a world first and is being supported by Acorn Australia. As sign language has different *dialects* it is planned that the final CD-rom will feature Australian, New Zealand and English sign.

Flossy artist Hans Rijnen is working on a 32-bit version of Dinosaur Discovery which will be a complete reworking of the 1985 original version. The release date for this Key Stage 2 adventure is set for the end of 1993 for £27.50.

Somewhere beneath the earth is a cache of dinosaurs' eggs. A professor had been working on incubating them and you have his diary. From this you must find, hatch and deal with a baby brontosaurus.

CD prices slashed

FOLLOWING on the heels of the reduction in prices of CD-rom drives from Morley and Cumana, comes a batch of educational CDs available from £25 each. These have been developed by Anglia TV (071-321 0101).

Understanding the Body and **Castles** contain libraries of still pictures, video sequences and specially constructed drawfiles, as well as animations and text aimed at 11 to 14-year-olds. A tutorial is provided and all illustrations can be accessed from a database as well as from within the main *lesson*.

● *Roman remains come with Castles' ambit*

The disks also come with a range of utilities such as notebook, calculator, stopwatch and measuring tool. So in addition to following the presentations on different facets of the subject, you can switch into a mode so that text and graphics can be ported into your own work. You do not have to have Key Plus to use these disks.

Castles explores the building, attacking and defending of a castle as well as exploring Chirk Castle at the time of Edmund Fitzalan, Earl of Arundel, meeting the people who lived and worked there. It is based on accounts which have survived from that time.

Details on over 150 castles around the British Isles are given and a suite of worksheets are available on disk for teachers and students to move to and from the computer in their investigations.

Understanding the Body holds over 500 slides ranging over four units: Introducing Humans, Cells and Tissues, Organs and Organ Systems and Reproduction and Genetics. In addition some specially prepared vector graphics allow you to remove layers taking off the skin to reveal the muscles, the muscles to show the blood circulation and so on.

Nearly half the secondary schools in the UK use Anglia's Key Plus and their first datafile on CD-rom is **19th Century Biographies**. This contains over 250 specially written biographies of men and women including scientists, politicians, writers, artists and villains.

More than 150 pictures from the Hulton Deutch collection are included and the range of data types available in the Key Plus system lets details of the people be classified for a range of searches and evaluations.

Using the Key Plus Map format are two further CD-Roms: Countries of the World and Counties of Britain, produced in conjunction with international map makers Bartholomew and giving access to a wide range of maps only previously available in printed atlases.

Each map comes with a range of features which can be turned off. For instance should you want to focus on transport systems railways, rivers or roads can be featured together or separately. Data held in datafiles can be plotted on the map and saved for further work or printed out.

Toon time

LOOKsystems (0603) 748253) have secured another conversion for the Acorn machines, The Bitfolio Cartoon Collection. Costing £30 (inc VAT) there are over 100 full colour cartoon characters.

The images are drawn, not scanned, for high quality output, easy editing and manipulation. In total there is 3.2Mb of data in draw file format compressed on to three disks.

If you need clipart for education – especially primary teachers – take a look at a new series of resources from GnatArt (0905 52501). Four disks are available at £5.60 per disk.

The drawfiles comes in two directories, one black and white images which can be coloured by hand, and also in a coloured version. GnatArt 1 contains images of animals, toys, Christmas with GnatArt 2 comes with more pictures of animals, clothes, weather and Easter. The third and fourth disks have a multi-cultural theme with drawings of people, patterns, music and so on.

Moving on

IOTA Software (0223 566789) have further enhanced DataPower, so that in addition to loading ArtWorks files you can also have Replay and animations stored and usable within the database.

Iota are also on the move and can now be found at Iota House, Wellington Court, Cambridge CB1 1HZ.

Kerning for all

GOOD news for those with collections of RISC OS 2 fonts. Design Concepts (031-668 2000) have produced Kerner which converts your existing outline fonts to the new RISC OS 3 format adding kerning information to give your text a more professional finish.

Kerning reduces the spacing between pairs of letters such as A W to AW so the gap is more like that between other letters. You can opt for automatic kerning or specify a letter pair, while all decisions can be inspected and changed in the editing system.

Included in the £15 price tag is Kern-All, a utility which changes the appropriate commands to the font manager to request kerning for all programs. Some applications do not tell the font manager that they are willing to have their fonts kerned, so if kerning information is in the font file it is ignored. Kern-All rectifies this.

Product spotlight

There has been some confusion over the cost of SoundLab and Oak Recorder from Oak Solutions (0954 211760). The latest version of Oak Recorder II comes with a new higher quality microphone, the interface also has a socket to allow other devices – such as CDs or electric guitars – to be accessed.

SoundLab software comes as standard giving oscilloscope and spectrum analysis as well as versatile editing. Samples can be saved in Armadeus or Relocatable Module format. The cost is £50.47 inc VAT. SoundLab software can be bought on its own for £24.62 inc VAT for people who bought the original Oak

250 FONTS ONLY £30

Fonts Pack 1

Columbia	Acorn	MegaType	Park Avenue	Jotter	Jayne
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Italic	SPLODGE	THEATRE	Friendly	Milton Keynes	Dubiel
Select	TECH	Cooper Black	Chicken	Lazy	SOLID
Hardcase	Balloon	Gangster Bit	Classic	Koch	Σψμβολ
YOUNG	Raven	Bolt	Buckingham	Swizz	
Old English	STOP	Palatino	Orange	Trio	
Citric	Cybernoid	Oxford	Amber	Baskerville	
		Reiner	Garden		

Fonts Pack 2

POST CRYPT	Laser	Andromeda	Informal	Borzoi	BUBBLE
Fax Script	Alison	FLINTSTONE	Architect	Gordon	New
Rickshaw	Heidelberg	METRO LINER	Chaotine	Video	TOY
Murder	EDDA	CAVEMAN	Chinese	Daytona	China Town
Oregon	Black	Jumanji	Charlie	Sweet	SNYDER
TERMINATOR	Square	Future	Conaith	Windsor	ESPHERES
Psychedelic		LED Style	Kathlita	Caligula	DEUSEX
Thalia	El Garrett	Graphic	Phaedrus	Jackson	STRONGMAN
					PONCHO

Fonts Pack 3

MULTICOLOR	Mardi	Juliet	Faktos	CUSTARDON	Good City
SIMPSONS	Koshgarian	Rockman	Hot Shots	Oak Wood	annie
HIGH SCHOOL	Romeodn	Broken	ICED UP	Duncan	SPIRS
Rep Square	RACKHAM	Camelot	Science	Micro	
Dragon	Quiz Show	Lauren	ZALESKI	LICHTNER	POINT
Mushy	KRAMER	My Words	Cairo	WEISS	GRUMAN
GLUMSY	Upper West	Honey	TRIBE	русский	JUNK FUNK
Kick Off	american	King William	BRAIN	TAX	Apollo
		Notepad			USA

Fonts Pack 4

SEEVES & WOOSTER	PURE METAL	First Wrds	ANTIQUE	EDITION	Nixon
Black Adder II	NEW YORK	Birthday	DIGIT CAD	CARADOS	DINER
BONES	METROPOLIA	Gessele	Gexo	Rain	SPARK
Vampires	SALTER	BORST	Anquillia	STEMS	Beatville
Chalk	GREEN	KLING	Creedmore	FoxTrot	Chopin
ELF JAZZ	rabbit ears	Royal Engrsh	Dickens		Mucho
FIRE	Galleds	Lombardic	Medusa	Madrid2	MANIA
WATER	Flemish	Pagania	Lilah	MAZAMA	Fundage
		DENNY			LEE

Fonts Pack 5

Liberal	NEON	Caraway	IMPRINT	Arctic	Polo
Ink Blot	Pixie	Harquil	RELIEF X	EIRE	STUART
Care Free	Poor Type	SHARKTOOTH	Comic Sans	FELTPEN	Fred
Skippy	DotMatrix	Coliseo	Bulmoth	Nordic	LOVE PEACE
Casual	REALWood	Scout	Sans Serif	luxembourg	Bad Boy
Paradox	Wood Strip	DELTA	Eye Brow	ASSORTMENT	Harrington
Arabian	ZanyRent	FeltMarker	Phoenix	Mira	こまへさろ
Maidstone		Genoa	Cracked	Big Town	FOLDER
Dragon Wish					

Amazingly Skyfall can give you 250 Standard RiscOs Outline Fonts for just £30 (supplied on 20 discs) or £22 on HD discs. The fonts are suitable for use with applications such as Ovation, Impression, & Draw, they are supplied with Bold and Italic styles. Individual packs cost £8 each.

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This Vision Mono Digitiser Offer (£48.28 inc VAT at 17.5% and P&P) is the best there has ever been for any computer, anywhere. It will not be repeated when the Offer expires at the end of January 1994. The Vision digitiser fits inside every Archimedes except the portable and can be easily fitted by the purchaser.

Also available is a Colour Vision Digitiser (£118.78 inc VAT at 17.5% and P&P) which has the same performance as the Mono but with the addition of colour.

The picture from both Mono and Colour digitisers is in the standard Sprite format and can be easily printed using the !Paint application supplied with your computer. Equally the picture can be manipulated in an infinite variety of ways within the computer and then used within a large number of applications from drawing to desktop publishing.

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ACNCOMP

My Acorn Computer Model Number is

I enclose my credit card details/cheque for the total amount Total £

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Soixante-deux

The family at No 62 Honeypot Lane have moved. However, Resource (0302 340331) have redirected you to their new locations in France, Spain and Germany. Now you can explore the house at any time of day or night, on any day in the year and in four different languages.

There is a mouse hole in No 62 but to find out more about the mouse which lives there take a look at Albert's House. Albert cropped up in Honeypot Lane but in this story you can explore the house, play hide and seek and rescue him from the lurking cat through some involved problem solving.

Albert's House is available on 8 and 32-bit machine for £20 and £29.95 respectively.

BookMaker is about to make its long awaited release and in its finished form is very much DTP with a difference.

Look out too for the support packs covering, Christmas, Fairy Tales, Farm Tales, Jurassic Parts, Postman Pat and Rebus. The latter has over 700 pictures for use in a wide range of self-publishing activities.

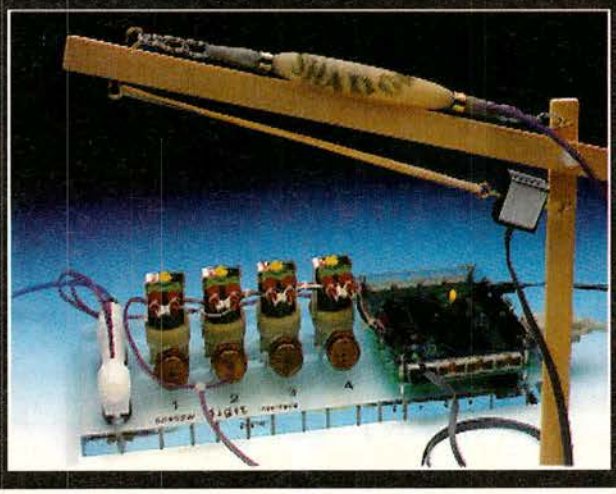
Tomorrow's robots

Viewers of BBC TV's Tomorrow's World may have seen an item on the development of the domestic robot. The group responsible for this research is The Shadow Project (071-609 8522) – the only group in the UK working on domestic robotics. Powering the robots is an Acorn 32-bit machine.

The Project are now selling kits including an artificial muscle powered by small quantities of compressed air and controlled from the serial port of any Acorn machine. The software control is via digiCon graphical software included in the kit.

Sequences of movement can be easily created with no programming knowledge. It is ideal for school CDT project work.

The kit consists of a control board with four air-valves driven by a digital interface and an eight channel analogue interface for the sensors. Eight boards can be linked and driven by one computer if you want further expandability.



● *Shadow Project ...power for the robots*

Creating a buzz

KRISALIS (0709 372290) have launched a budget range of game software under the BUZZ label. The budget market hasn't hit the Acorn machines before but now you can play classic games at a fraction of the original price.

The first batch of releases will all be out for Christmas and cost £9.99 each: Manchester United, Swiv, Mad Professor Mariati, Revelation and Jahangir Khan's World Championship Squash.

DTP developments

Smart DTP (0332 842803) have released a £14.95 disk of clipart for anyone involved in Electronic Circuit Development. More than 200 drawfiles are aimed at people taking GCSE Design Technology. They have also cut the price of their 1993 Christmas clipart disk of 32 seasonal drawfiles to £2.50.

Sprite value

FOR anyone interested in adding their own pictures to wordprocessor or DTP documents or using them as a basis for art projects, take a look at the special offer from Sonamara Distribution (0635 299676).

The Mono Vision Digitiser was always good value for money at £59 but until the end of January 1994 you can buy one for £39 plus VAT. The digitiser produces high quality black and white pictures from video records, camcorders and the like with the results easily added to other RISC OS packages.

Images are taken in real-time with a resolution of 254x720 lines. It allows picture post-processing and incorporates contrast, brightness and saturation controls as well as being PAL compatible.

The digitiser is available as a minipodule for the A3000, A3010/20 or A4000 while a half-width podule fits into the older A300/400 series, A540 and A5000. You'll only need 1Mb of ram too.

Bargain systems

RISC Developments (0727 840305) have bought all Acorn's remaining stock of the 25Mhz A5000 Learning Curve systems since the release of the 33Mhz machines. The St Albans-based company are now offering these at the reduced price of £850 with monitors sold separately.

The A5000s feature ARM3, 2Mb ram and a 80Mb hard disk with RISC OS 3.1. The Learning Curve pack contains the PC Emulators, First Word Plus, Acorn DTP, Genesis Plus, Pacmania and an audio training tape.

RISC Developments are also holding a special Christmas Open Day on 12 December between 10am and 4pm at their offices at 117 Hatfield Road, St Albans. They will be joined by Acorn and many of the major companies, including the *Acorn Computing* editorial team.

The Complete Solution

Memory

A310 2Mb*	£99.00
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A310 8Mb	£339.00
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A440/1 8Mb	£339.00
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A3000 4Mb	P.O.A.
A5000 4Mb	£89.00
A5000 8Mb	£339.00
A3010 2Mb	£49.00
A3010 4Mb	£149.00
A3020 4Mb	P.O.A.
A4000 4Mb	P.O.A.

Networking

A400 series cards

10base2	£149.00
10baseT	£149.00
10base5	£149.00
10base 2 + 5	£199.00
10base 2 + T	£199.00

A3000 series cards

10base2	£149.00
10baseT	£149.00

Parallel port ethernet

10base2	£199.00
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N.B. Quantity & Education prices available

Ethernet Repeaters

2-port	£210.00

10baseT Hub Box

10baseT hub	£199.00

SaferTap Network Wall boxes

Wall box	£16.00

SaferTap Network station cables

2.5m	£13.50
5m	£18.50

10base5 convertors

10base5 to 10baseT	£65.00
10base5 to 10base2	£65.00
10base5 to FOIRL	£199.00

Network software

TCP/IP suite or AUN	£399.00

Parallel SCSI interfaces

Mono SCSI	£49.00
Printer SCSI	£75.00
Network SCSI	£99.00

Hard Discs

IDE drives - 2nd A5000s

80Mb	£149.00
170Mb	£199.00
240Mb	£229.00

SCSI drives - Internal

170Mb	£249.00
345MB	£349.00
500Mb	£455.00

For external system (case+cables), add £65.00 to the cost of drive.

SyQuest removable drives

44Mb 5.25" (SCSI)	£325.00
44Mb cartridge	£60.00
105Mb 3.5" (IDE)	£399.00
105Mb 3.5" (SCSI)	£385.00
105Mb cartridge	£60.00

Removable magneto-optical drives

Fujitsu 128Mb drive (inc. one disc)	£699.00
Extra 128Mb discs	£37.00

2.5" drives

Phone for latest prices and availability on replacement drives for A4 and A3020 computers.

A400 series drive interfaces

IDE	£79.00
SCSI	£149.00
SCSI Cached	£199.00

External hard disk boxes

3.5" Dual Open Front	£85.00
3.5" Dual Closed Front	£85.00
5.25" Open Front	£75.00
5.25" Closed Front	£75.00

Internal hard drive fixing kits

SCSI Int. 400	£15.00
IDE Int. 400	£15.00

Other products

Back planes

2-slot & fan	£38.00
4-slot & fan	£60.00

ARM3 upgrades

ARM3	£109.79
Fitting to A3000 charge	£18.00

Aleph One PC cards

386PC 25MHz (0Mb)	£375.00
486PC 25MHz (0Mb)	£480.00
387 Co-processor	£99.00
1Mb RAM upgrade	P.O.A.
4Mb RAM upgrade	P.O.A.

RemoteFS

Parallel port	£49.00
Serial port	£49.00
Parellel & Serial	£59.00
Network	T.B.A.

RISC OS 3 upgrades

RISC OS 3	£75.00
Header PCB	£25.00

F.P.A. co-processor £99.00

P.O.A. - Due to fluctuations in the current RAM market, the cost of memory upgrades is likely to go up, or down! Please call us for the latest prices.

* Prices include courier collection and return in the UK. All prices exclude VAT (@ 17.5%). E&OE

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Fight against substance abuse

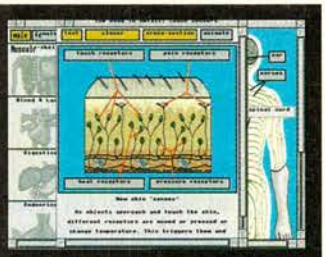
IN ASSOCIATION with the Department of Health, Acorn are sponsoring a major educational campaign called Acting for Health – Drugs, Smoking and Alcohol Misuse. This takes the form of a competition for school children and aims to encourage them to think creatively about the dangers of substance abuse by exploring ideas for a video storyboard.

From the entries 100 schools will be chosen to send their teams on a film-making weekend at a Superchoice Active IT Centre. Once there they will learn how to use the latest Acorn equipment to make films.

The top three winning entries in each category will be awarded a top of the range Acorn computer system.

Acorn's MD, Sam Wauchope commented" Our involvement in this initiative demonstrates not only our concern about major issues currently being faced by schools, but also supports our aim to provide innovative technology products which really do address the needs of education today."

Educationally speaking



FOLLOWING the success of Crystal Maze at the Acorn World Show, Sherston Software's (0666 840433) next few releases will have an education rather than a leisure theme.

Sherston have joined forces with Oxford University Press to produce the first talking books for a UK reading programme – the Oxford Reading Tree. There will be six Stage 2 stories and will be priced at £39.95.

● *The Oxford Reading Tree is now in your micro*

The Oxford Reading Tree is the UK's most popular reading scheme and the Talking Books use the voice of Hannah Gordon and Alex Brychta's illustrations punctuated by animations and sound effects. Children can click on individual words or listen to the tale in a similar fashion to Naughty Stories.

Also under development is BodyWise, a discovery package which allows exploration of different systems of the body – with the reproductive systems passworded. You can go into areas in more detail with successive windows opening as you delve into cross-sections. Alternatively you can opt for placing organs in the right places on the body. The price is £39.95.

English as she is spoke

LEARNING grammar should be easier with the release of Practice in English Grammar from Information Education (0782 281643). As well as a definition of terms there are examples. Each definition is linked to an exercise to practice the analysis and identification of the grammatical features.

Practice in English Grammar
Page 112
Noun: genitive (key)
Chapter 4.1
Here are some examples:
captain the captain's table
engineers all the engineers' proposals
women some women's rights
bus the bus's poor service (?the poor service of the bus)
reports their reports' conclusions (?the conclusions of their reports)
driver the driver's mistake
teenager a teenager's paradise
cities both the cities' facilities
staff all the staff's concerns
mind my mind's eye (perhaps only this expression)
machine the machine's breakdown (?the breakdown of the machine)
feet my feet's tops (better: the tops of my feet)
Press (1) to return to the Exercise, (2) for the Definitions.
Back one Page
Contents
Retrace
Next Page
Charlie
Apps

● *Get your grammar right every time*

Aimed at English A level students, undergraduates and intermediate and advanced students of English as a Foreign Language, this new title in the ViewBook range was compiled by Howard Jackson who is Professor of Linguistics and English Language at the University of Central England in Birmingham.

Eight-legged card

FRENCH company Ashiv (010-33-1-48 58 70 77) have developed a powerful and versatile eight-serial port expansion card. The ports are independent, full-duplex and asynchronous supporting baud rates from 50 to 38400, five to eight bits data format and programmable stop bit length.

Mixable RS422 and RS423 outputs are one the same single width card. Up to four cards can be fitted on the A300/400/500 and A5000. The software and drivers are on board, you just plug in and go.

The Octopus eight serial port expansion card costs £360 with µSubD-PC and µSubD-BVU cables at £8 each.

● *The Octopus serial card gives eight outputs*

Special Needs award

THE winner of the TES/Semerc Special Award which was launched this year, has been awarded to five-year-old Christopher Hamill-Hope from Liverpool. He has cerebral palsy, athetoid/ataxia quadriplegia and very little controlled voluntary movement, but over the last two years he has shown great progress using Special Needs software and hardware.

In recognition of his work he was presented with an A4000S so that he can continue practising and improving at home as well as using the computer for leisure and games activities.

An award for a special user located in the south of England will be presented at BETT'94 in January.

● *A great award for a special user*

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0788a	Mouse Mat - Red	BEEBUG	3.36
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4084c	SuperCharger Joystick	Quickjoy	9.50
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BOOKS/MANUALS

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5481b	!Help 3	Sherston	9.95*
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5856b	A4 Portable Handbook	Acorn	7.50*
5857c	A4 Technical Ref Manual	Acorn	65.00*
5855b	A4 Welcome Guide	Acorn	10.00*
1252c	A5000 Tech Ref Manual	Acorn	65.00*
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**Promotional price while stocks last, then £72.34.*

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5290g	Arch IDE 20Mb Hard Card	RISC Dev	199.00
5292g	Arch IDE 80Mb Hard Card	RISC Dev	299.00
5293g	Arch IDE 120Mb Hard Card	RISC Dev	379.00
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4602e	A3020/4000 Ethernet Card	RISC Dev	139.00
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- Mike Cook continues to develop his computer-aided telescope
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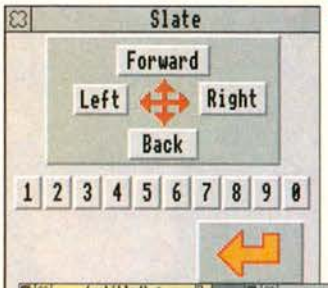
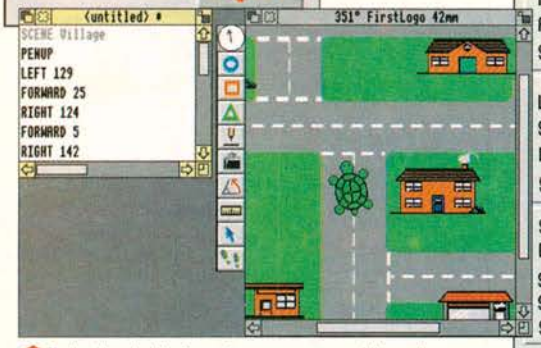


Slates allow easy entry of commands, simply by clicking



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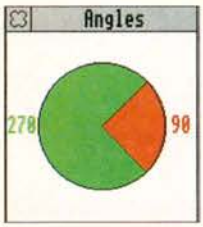

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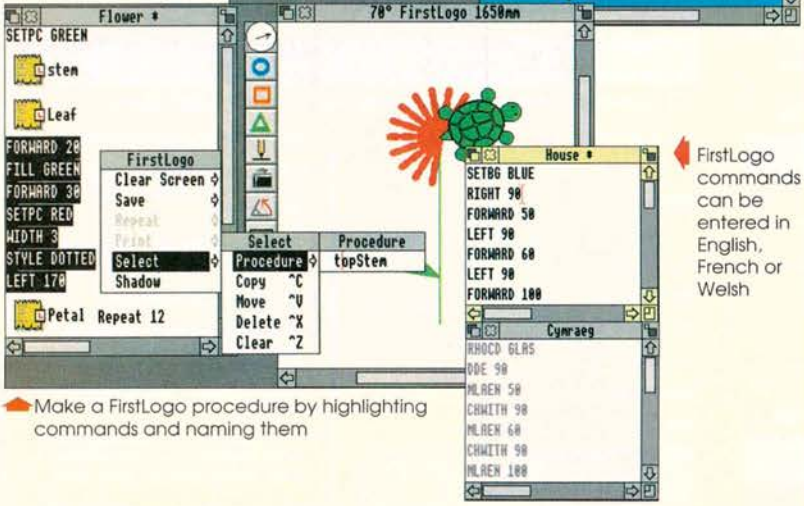

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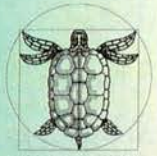

LONGMAN LOGOTRON

JOIN THE CD-ROM REVOLUTION

Win your own CD-rom drive PLUS five CD titles worth £500

PLUG in and go, is the motto of the new Morley Revolution CD-Rom drive for all 32-bit Acorn machines. Developed by Morley using the latest Sony CD-Rom drive it works as well on the A3000 as it does on the A540.

Incredibly the price is just £299 and all you have to do is plug in the interface and drive, switch on and go. Equally at home in the school, home or office the Revolution has been built to be durable and cost effective.

This multi-session drive is Replay and Kodak PhotoCD compatible. As it uses Acorn's CDFS, it is compatible with existing hardware running under RISC OS 3 and can be used with RISC OS CD-Roms as well as being able to access DOS-based disks and run them through emulation. You can even play audio CDs too.

Morley have put together a multi-media package exclusively for readers of Acorn Computing. As well as a Morley Revolution CD-Rom drive, they are giving away five CD-Roms to use with it:

- Space Encyclopaedia
- Dictionary of the Living World
- Creepy Crawlies
- Grooves
- Image Warehouse

Plus you'll get a pair of stereo speakers.

For the next five lucky winners, there are 12-issue subscriptions to *Acorn Computing* on offer. As well as being chocked full of information there are two disks of programs for education, games players, programmers, plus a host of utilities for all Acorn users.

What to do

If you want to be one of the six prize winners all you have to do is find the right answer to the following five questions. The closing date for the competition is 31 January 1994. The first correct entry will win the Revolution CD-Rom drive and disks and the next five winners will each receive a 12 issue subscription to *Acorn Computing*.

The questions

1. What was the Russian manned space station called?
   a. Apollo
   b. Mir
   c. Soyuz

2. The international organisation for the protection of endangered species is called:
   a. WWF
   b. RSPCA
   c. UNICEF

3. The female Black Widow spider is notorious for:
   a. Her longevity
   b. Not being black
   c. Killing her mate

4. The American home of jazz is:
   a. Harlem
   b. The Bronxs
   c. New Orleans

5. Michaelangelo painted which famous church:
   a. Canterbury Cathedral
   b. Sistine Chapel
   c. Notre Dame

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The answers

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Alpha plus

Phil Tayler learns his alphabet and phonics

ONCE in a while I really do regret having to return a program which I have been reviewing in my school, because it has proved so useful and effective that life without it, if not impossible, will certainly not be as easy.

I have never come across Xavier Software before, but if the rest of their educational products are of a similar standard, I shall certainly be having a look at their range.

They are based in the Psychology Department of University College, Bangor, and specialise in software aimed at Special Needs children, particularly dyslexics, using their own Bangor Dyslexia Teaching System.

Alpha Sound is designed to give practice in the order of the letters of the alphabet and their phonic sounds. This hardly sounds exciting, but a visitor to our Support Teacher's room while the program was running would have seen interested and enthusiastic children, eager to have another go.

Sampled speech is used extensively throughout the program, either to give the name of a letter or its sound, or the pronunciation of a word.

Obviously, children with Special Needs require a great deal of repetition, but this can either become boring or the adult can become frustrated. Computers never get frustrated and there is certainly enough variety in these games and exercises to keep children interested for many sessions.

The Tutor disk is more basic in its scope, with routines for learning the name and sound of each letter, as well as matching activities.

The main screen allows the choice of either the name of the letter or the sound it makes being played when clicking on the appropriate icon.

The activities are similar to those which would be used through other methods in many programmes for children with Specific Learning Disability but here the context is much more fun and the results proved to be very encouraging.

The letter, in both upper and lower cases, and a graphic such as an apple for "a", are shown on the screen and the child needs to click on the letter and picture to hear the sound and the word.

There were children who found the sounds given for *f* and *s* to be very similar and somewhat confusing, and the teacher should be checking that the child is pronouncing words and letters correctly.

Another variation has the child identifying which, of a rainbow of alphabetical letters, made the sound and trying to beat a timer. It's not great use of technology in one sense, but the tutor disk does lay the foundations for the next one – the Practice disk.

This builds on the earlier practice, through three well thought out activities:

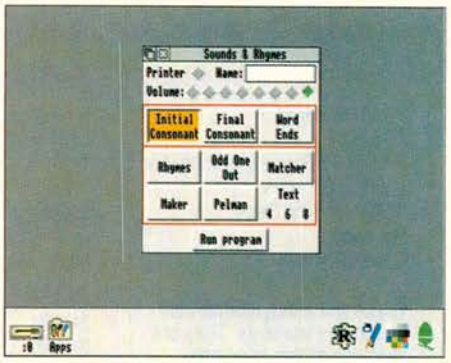
Sort involves the child developing his knowledge of the sequence of letters in the alphabet by identifying which letter fits into the gap shown.

Game is an excellent motivator, and involves shooting alphabet spaceships in the right order, with satisfying zapping noises.

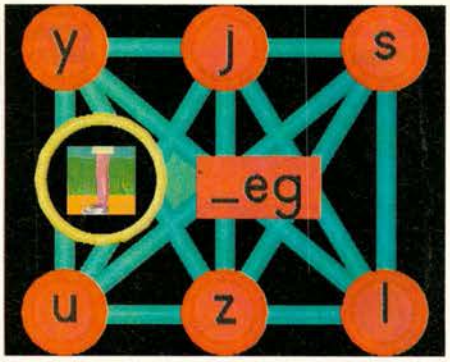
Practice activity involves a game of patience, where the letter and the picture have to be matched up, with the cards either face down or up, which is much simpler.

On many programs, a tutor screen identifies the mistakes made by each child, which means that the teacher could use her time well with another child on a different activity– or even another computer.

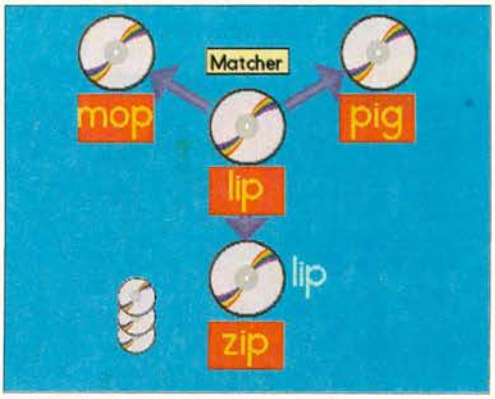
Sounds and Rhymes is more advanced. Sounds, deals with the areas of short vowels and individual



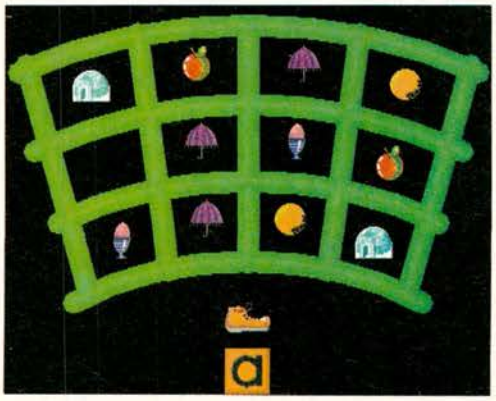
● *Stories and Rhymes Main menu*



● *From Initial Consonants – a nice picture of a zeg? jeg? leg?*



● *Which word rhymes with lip?*



● *Which of the pictures begins with a?*

PRODUCT SPOTLIGHT

Product: Alpha Sound/Sounds and Rhymes
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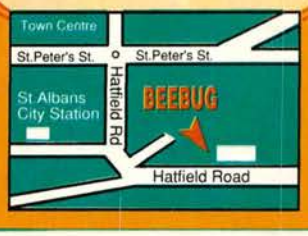

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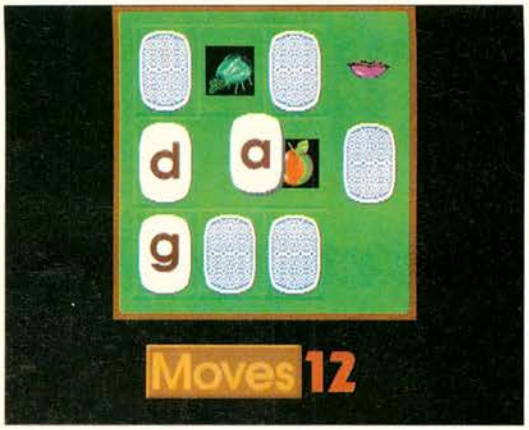
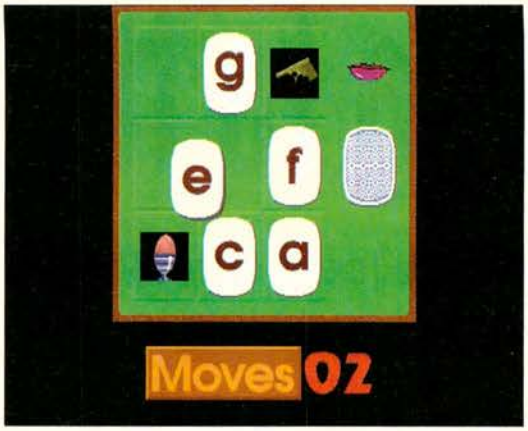


● *Patience is certainly needed here ...*



● *... although it's easier with the letters showing*

➤

sounds within words, while Rhymes is self-explanatory. The Sounds disk has five activities, the first three being consecutive in use.

Here a grid is drawn and, on clicking the mouse a disk floats across the grid. The child has to trap the disk, thereby developing hand/eye coordination, whereupon a graphic fills one area.

The graphics are nicely drawn but only use apple, egg, igloo, orange and umbrella for the vowel sounds, rather than a wider range of words. Again it is expected that the child is joining in by saying the word and sound.

After a cycle of these the grid becomes full, and a vowel appears at the bottom of the screen. The child needs to click on an appropriate picture – or else on the boot if there is no picture with the displayed letter. Once the grid has been cleared in this way, a word is shown in a large, clear style, with a vowel missing, and the child has to identify the correct vowel which is dragged and dropped by the mouse.

Part four deals with vowels between two consonants, such as *bed* or *log*. The picture is shown, and can be sounded by clicking on the picture. The child then has to drag the picture to the right vowel family.

The game on this disk involves catching the correct vowel ball to fit the picture displayed on the screen. No speech is available at this point and a timer is working.

The Rhymes disk is probably the pick of the bunch, not just because it has eight activities, but because they are all excellent in use.

Initial and **Final Consonants** are very similar, with the child needing to select the right letter from six displayed around the screen to begin or end the word of the picture shown.

Word ends takes this further with the final two letters of the word. Rhymes, Matcher, Odd One Out and Maker all cover aspects of simple rhyming words.

The simplest, **Rhymes**, asks the child to click on the tick or cross, depending on whether the two pictures and/or words rhyme.

In **Matcher** four CDs are shown, with the central word linked to the other three. The child needs to identify the correct rhyme, either by listening to the words, or by looking at the optional text words on screen.

Odd One Out uses a CD format again, this time identifying the one of the three which does not rhyme.

Maker gives a number of letters around the screen, with a displayed target word and graphic. The child has to build words by dragging letters to make other words which rhyme with the first.

A useful piece of error trapping here is that the child has to build the word from the left, so helping to develop left-right discrimination.

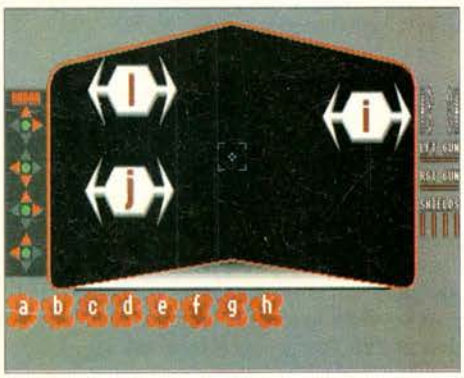
The programs are all designed to run under RISC OS 3, but on earlier machines an additional module is loaded into memory, so there should be no compatibility problems.

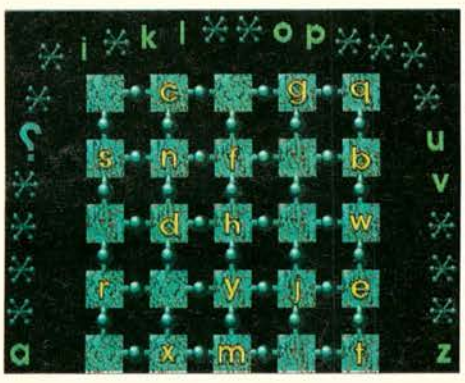
There is an original – and very effective – form of copy protection, which does not in any way affect the ease of using the disks.

The disk is registered by entering on screen the name of the buyer, and this is encrypted on to the disk itself. A Lock Code is displayed, and anyone wishing to backup the disk, or load it on to a hard disk, needs the specific Unlock Code, available from the suppliers.

An illicit copy will be of no use while correct registration brings an effective site licence to that school.

● *Zapping the alphabet space ships is good fun*



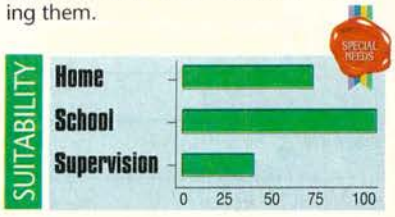


● *Alphabet sort gives excellent practice in learning the alphabet*

Summing up

In general these programs would be of no interest at all to anyone not involved in the education of young children, or those with learning difficulties. This is a comparatively specialised field, and as such it has not been particularly well served as far as software is concerned.

This set of programs was described by my experienced Special Needs teacher as *The best programs I've ever seen – I don't know what I'll do without it.* The programs tackle a fairly narrow area, but are so successful in the way they do it that we will certainly be buying them.



Adding to the library

John Clemence looks at two programs for graphing and vocabulary work

PRODUCT SPOTLIGHT

Product: Pictogram and Word Library
Price: £20
Supplier: Kudlian Soft, 8 Barrow Road, Kenilworth, Warwickshire CV8 1EH.
Tel: 0926 851147

ONE OF the plus points for schools with Acorn machines is the range of useful economical software just for them. Some of these programs even come in pairs such as Pictogram and Word Library.

Pictogram is a simple graph drawing program. As its name suggests, it draws pictograms for small collections of data, up to six headings and using pictures, up to 10 objects per heading, while using a block or bar chart increases the number of objects to 20.

All graphs can be displayed horizontally or vertically, printed and saved as a datafile or drawfile so you can work on the data later or put your graph into a piece of desk top publishing.

Kudlian Soft also publish the DataSweet, and files from Pictogram are compatible with DataPlot and DataPlot2, so when the numbers exceed 20 work can be transferred easily from Pictogram to DataPlot.

Word Library, an application that can be used with other multi-tasking programs, enables children to dip into collections of words. These are then inserted into their work at the current caret position. I tried this with PenDown Plus, Impression, Full Phases, Edit and Draw and they all worked perfectly.

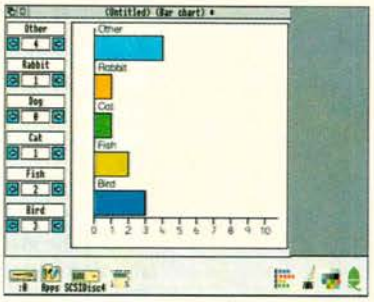
There are various options for displaying the words, which appear in a window to be dragged to any convenient place on the screen. The width and height of the window can be altered and the number of columns of words varies to fit.

However, you can choose to have the alphabet displayed across the top of the window, and that then determines the minimum width of the word bank.

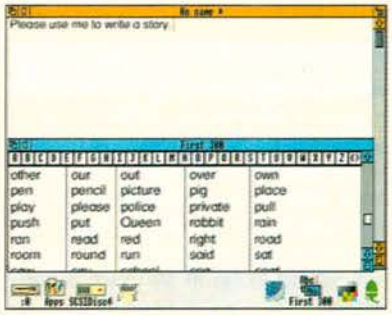
Selecting a letter from the alphabet takes you directly to words beginning with that letter, while other options include the use of an outline font and different coloured title bars for the word banks, so you could have different kinds of supportive words colour coded on the screen.

There is also an option which allows a space to be inserted quite automatically after a word has been entered into the text.

Users with Special Needs can be supported by choosing the scan option which slowly displays each word in the list until a switch is pressed. The speed of scanning can be altered to suit the user. A user port is required for this option.



● *A simple bar chart which could be customised later*



● *Basic use of Word Library in Phases*

Summing up

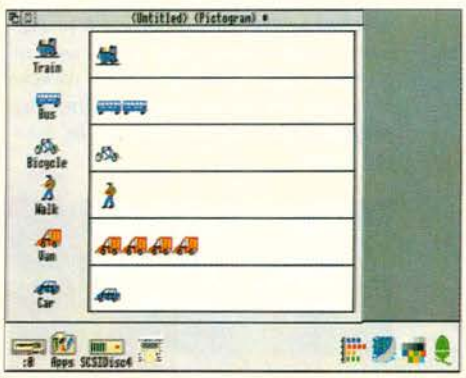
Pictogram comes with a useful range of pictures contained in a directory within the application. It seemed to me that it might be possible to increase the range of pictures if you have the appropriate skills, but the manual makes no mention of how you might do this.

For each of the picture sets given there are useful and, in terms of National Curriculum Attainment Targets, well annotated notes for usage in the classroom.

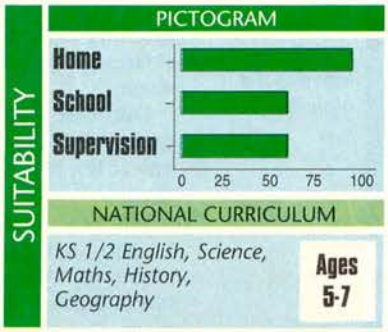
Word Library's banks are easily created using !Edit and can be tailored to support a theme, children with a limited vocabulary or for use in foreign language teaching.

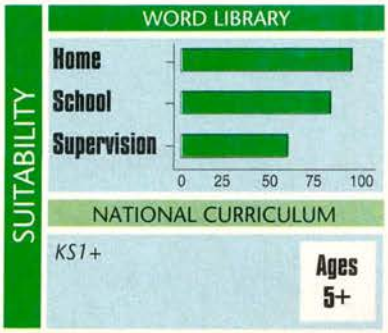
More experienced or adventurous users can create simple applications, but there is no need to do this since any simple text file works just as well.

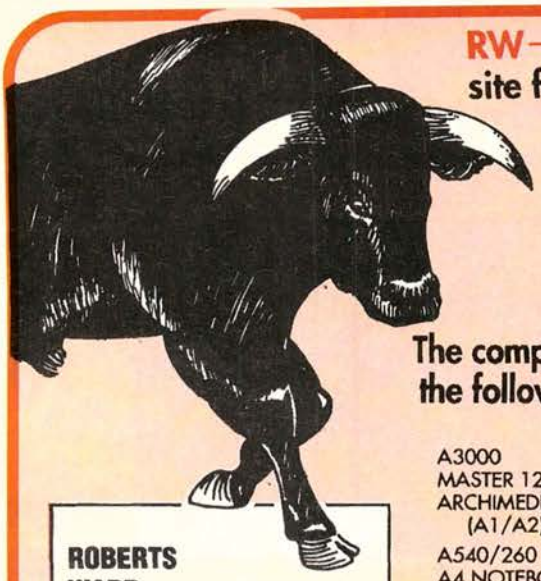
One of the examples is a collection of dinosaurs, while another gives the 300 most common words. The children in my class of Year Five children have already found this quite useful while working with PenDown Plus.



● *Using sprites to enhance the presentation*







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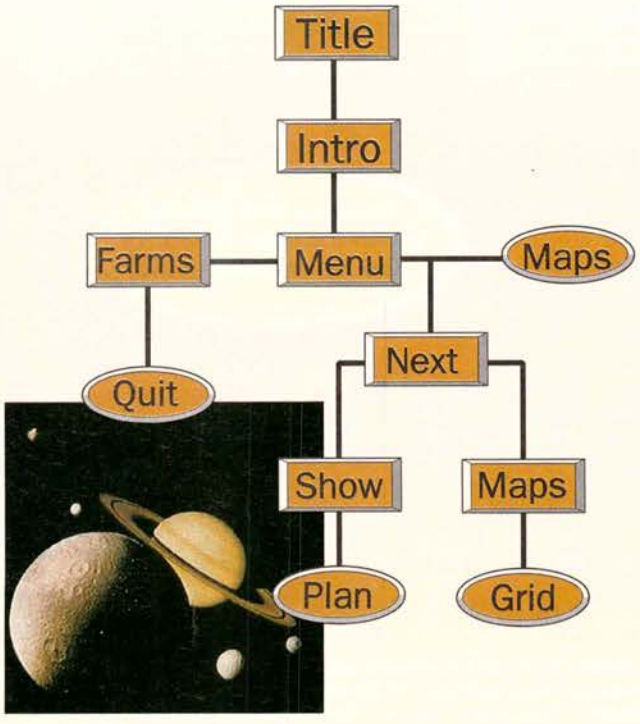

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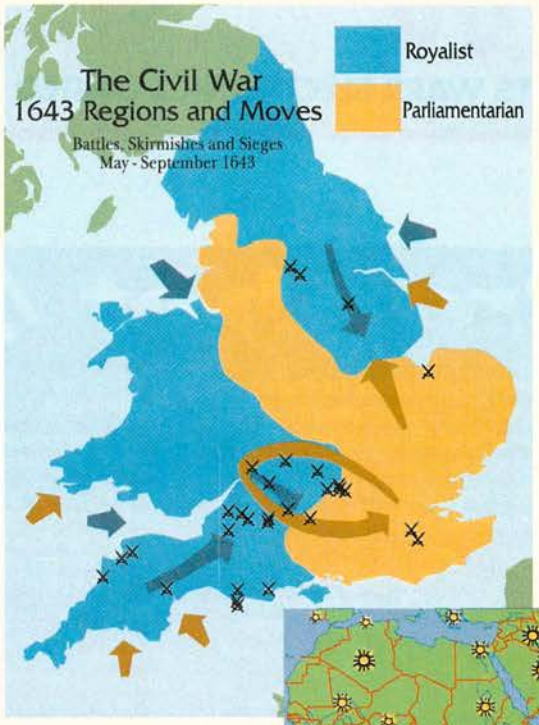

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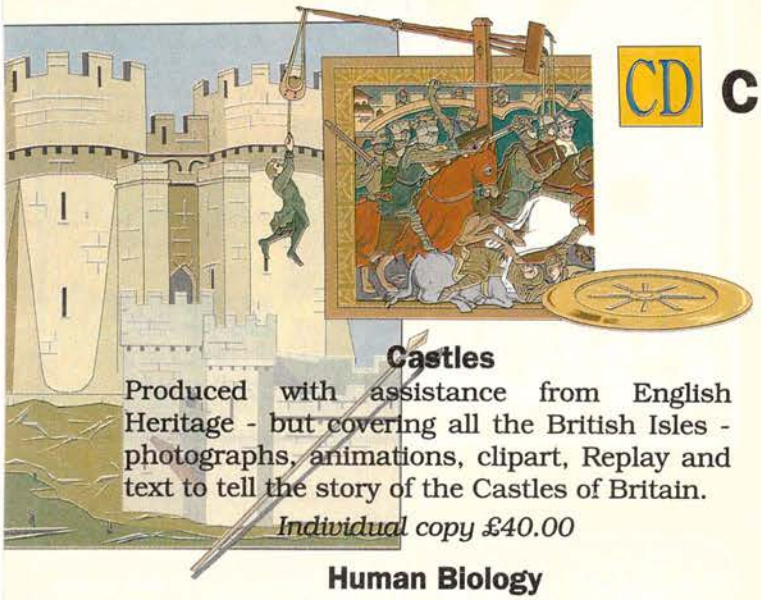

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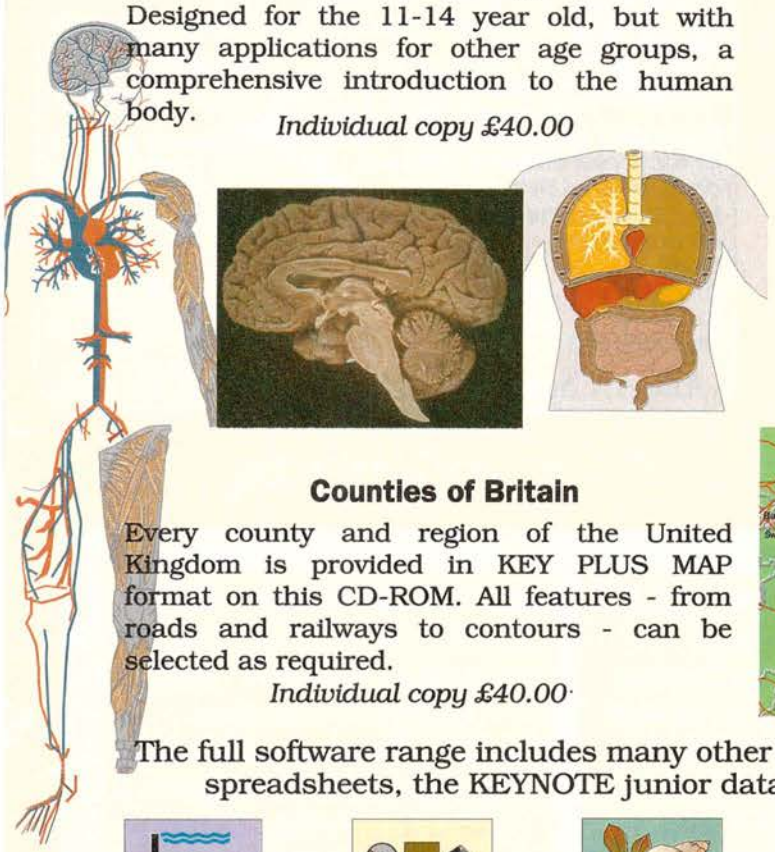

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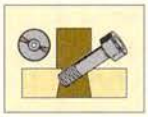

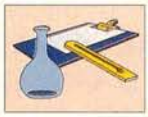

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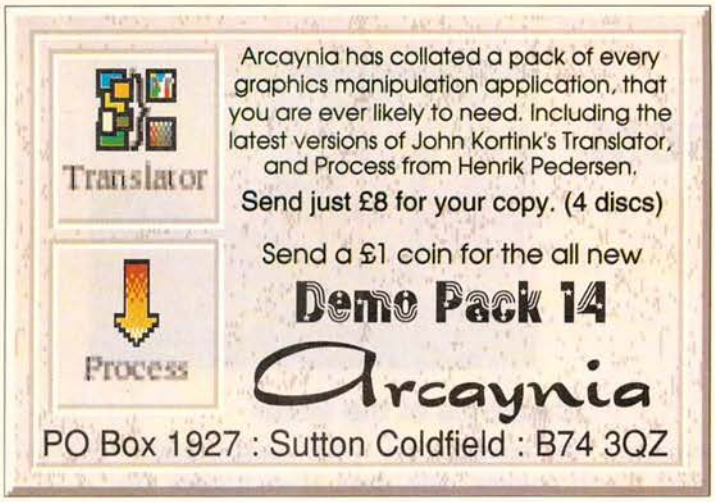

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Unlucky for some

Teri Paul takes her thirteenth column into the realms of viruses, utilities and humour

PROTECTING your machine and software from infection or the light-fingered has inspired a number of people in the past few months. The module virus seems to be re-emerging, but there really is no excuse for falling victim.

For those of you who don't subscribe to !Killer to dispose of viruses, there is a new version of **GuardianPD** as well as a commercial version, GuardianPRO, both from Digital Phenomena.

Paranoia can be good for your health, and winging its way on to the page is **!LockDir** from Bob Harding which simply locks a directory.

A program is copied into a directory and locked and the next time someone tries to access it they'll be asked for a password. Not foolproof, but a good block for inexperienced little fingers.

Bomb Shelter has been designed to stop unauthorised access to disks by viruses and programs which are not functioning properly. It comprises two parts, a wimp front-end and a module.

You can choose which operations you want queried – such as deletion, renaming and changing access parameters – as well as being able to toggle the program on and off from the iconbar.

For the truly nervous there is a *Paranoid* option which prevents the module/program itself from being deleted from memory.

The program's title sums up its philosophy totally. An interesting idea, but I don't know how useful it will be, I suppose it depends on your working environment – I'll be sticking to VProtect.

I have covered some shareware anti-theft solutions in the past, add to these **DeskGuard** from Neil Young. You can use this program to protect directories – or your whole machine for that matter – against prying eyes as no one can gain access without the password. Neil will set the password for you, so let him know what you want when you register.

When DeskGuard is activated the machine just sits there – you can move the mouse, but that's it. Registration costs £3 and you can contact Neil at Quatre Saisons, Rue Des Deslisles, Castel, Guernsey, Channel Islands GY5 7DS.

● *Survive within your Bomb Shelter from viruses and strange coding*

Customising your workspace

Let's get the desktop sillies out of the way. My new friend, **Mouse**, comes to a desktop near you complete with mouse trap. Your pointer grows a tail and should you be so innocent as to try to get the cheese from your iconbar, a mousetrap will grab you ignoring your squeaks of protest.

You'll find that you can't move the mouse, though by selecting the right mouse buttons you can escape. Definitely one for Tom.

If this humour is too black, add a little sunshine to your life with **Sunny**. Loading it on to your iconbar you can toggle the smiley animated sun on and off as your mood dictates.

I've been inundated with letters about the 3D icons you have seen used in the magazine. Well these are part of the NewLook icons released by Acorn at the Acorn World show and given away free to the first 15,000 people. What do you mean you didn't go?

However, this does not stop other backdrops and tools being created for the desktop, I'm pleased to say. Take a look at **BackDrips** by Colin McEwan. This desktop selector making use of the Pinboard module in RISC OS 3 gives you the choice of

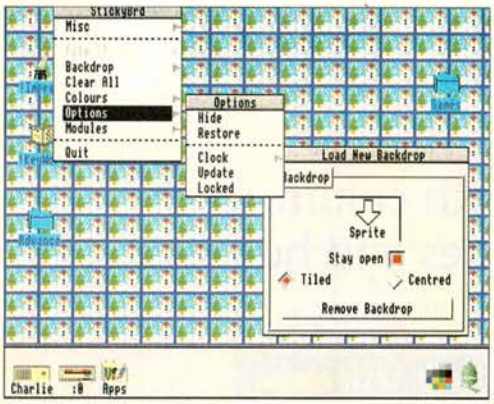
➤

● *Guarding you against viral infections*

● *Your personal guardian against prying eyes and over-adventurous fingers*

● *Play mousetrap or keep your sunny side up?*

● *Locked against all intruders, unless they know the password of course*



● *StickyBrd has greater versatility than Pinboard*

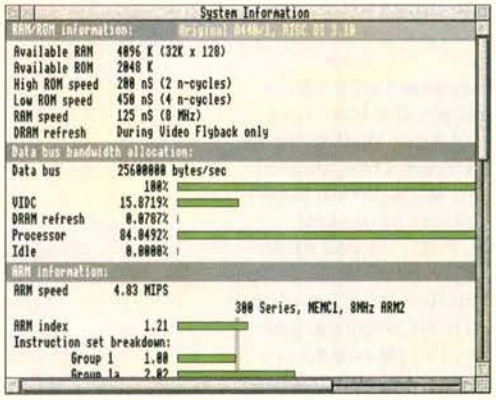
● *Change your backdrop to suit your mood*

➤

42 ready-made backdrops.

A nicely constructed program, from the fluttering Saint Andrew's Cross on the iconbar to the quality of the backdrops themselves. The only problem is when you quit from the iconbar menu all icons are cleared from the Pinboard. Whoops.

Also from Colin and for RISC OS 3 machines is **TOOls** which offers 10 sets of tool sprites: 3D-Shade, AjC'sTools, BigTools, SmallTools, Rainbow, Textured, PushButton, Tracks, RoundTools and AppleStyle.



● *Only some of the information about an A440/1*

Putting a bit behind

Sticky backdrop programs are both popular and useful or they wouldn't be found on so many different platforms. All RISC OS 3 machines come with Pinboard, which isn't perfect and, of course, still leaves RISC OS 2 people out in the cold.

Placelt, with its famous banana icon, still inhabits my RISC OS 2 machine and the more recent Larger gives you a *virtual desktop* which is well worth looking at even though it does cost £10.

Another alternative is StickyBrd. The principles are the same, your basic grey desktop will hold anything you put on to it – including wallpaper. Should you want to load the programs stuck to the desktop all you have to do is double click.

The programmer, David Seery, doesn't assume everyone has a hard disk and instructions in the help file are easy to follow. In addition to holding frequently-used applications and data, you can Shift+double-click on applications to open them up for viewing – just as in a Filer window. Indeed files, directories and applications react to StickyBrd just as if it was a filing system.

In addition the menu gives various options for running the program, giving information on highlighted files and the facility to specify a desktop name in the writable icon which is loaded or saved and the desktop redrawn if necessary. You can also remove icons or open the parent directory.

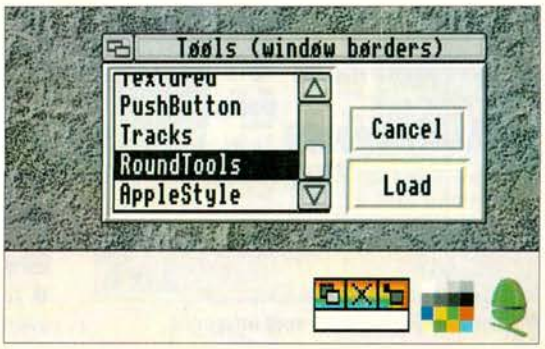
For a bit of colour you can load wallpaper as well as get information on the sprite which formed it, and there's a restore option to the last save should you change your mind.

An option called Turbo gives a faster display and redraw, useful if your wallpaper sprite is in a 16 colour mode. There are the usual options to clear the desktop and change background and foreground colours for text below the icons.

Icons can also be hidden and a clock displayed in various forms. StickyBrd also implements the Apple Mac feature where you can click Menu over a Filer window's title bar and see a menu of each directory level from the current one up to the root. Clicking on one opens that directory level. Highly usable, Mr Seery.

A number of programs which arrived on my desk recently are interesting and well designed, but I can't think of a use for them. But they have been filed ready for the time when I'll need that certain bit of code to solve a problem.

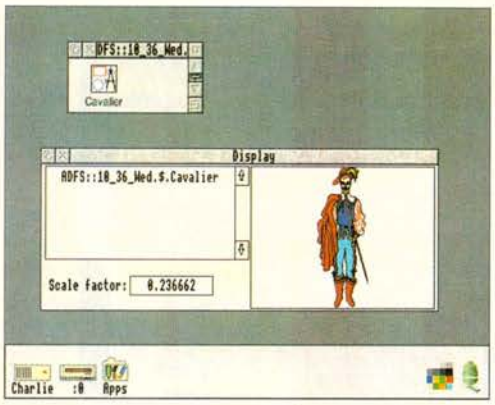
In the meantime, there are others which I can either find an



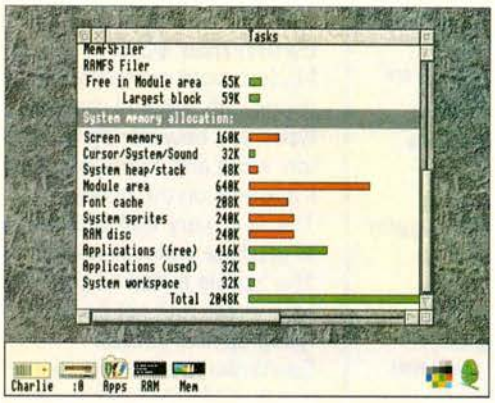
● *A change is as good as a rest – so alter your scroll bars and tools*

This month's featured PD

Program	Library
ArmSi	Planet PD
BackDrips	Gem PD
Carols93	Different Ideas
Display	Craig Beech
GuardianPD	Digital Phenomena
IClear	Martyn Fox
LockDir	Craig Beech
Memphis	Planet PD
Mouse	Planet PD
Bomb Shelter	Gandalf
StickyBrd	David Seery
Sunny	Gem PD
Tools	Gem PD



● *Display lets you see your drawfiles without Draw*



● *Choose your weapon: Ram disk or Memphis – or both*

immediate need for or at least deserve loading on to my near-overflowing hard disk.

Utilities with a purpose

First off is **ArmSI** which measures those curious beasts MIPS and FLOPS – as well as dhrystones in this version – on the range of Acorn machines. Apart from feeding the curiosity it is useful ammunition for reports.

PD modules fill a useful role in the Acorn market and Martyn Fox's **IClear** for RISC OS 3 machines aims to make it easier to delete text from a writable icon.

Normally you have to either delete all the characters or press Control+U to replace text. This can be a nuisance, especially if you have just selected the icon with the mouse, as you first have to transfer to the keyboard, then press Control+U before you can type in your new text.

With IClear running, simply double-click on the writable icon, using either Select or Adjust. The icon will be inverted, which usually means that it will turn black with white text. As soon as you press a key, the text in the icon will vanish, to be replaced with the character you typed.

If you change your mind after inverting the icon and decide you want to keep your original text, a further click with any mouse button anywhere on the screen will put things back to normal.

The software will work with writable icons (Button type 15) and also dragable writable icons (Button type 14) but not with writable menu items.

A nice little program for anyone dealing with a number of drawfiles is **Display**. Similar in concept to Glimpse from Sherston and Applications Manager from Longman, it only deals with drawfiles – but it is PD.

You simply drag your drawfiles from floppy or hard disk into the window which appears after you load the program, then clicking on the name of each file brings up a representation in a second window with its scale factor.

It doesn't load Draw and is ideal for anyone managing DTP from a floppy disk, as judicious use of Display and the ram disk saves disk swapping and memory juggling .

Replacement ram

Another program you might find more useful than the standard ram disk is **Memphis**. This replacement ram disk can be resized at any time and if you are using RISC OS 3, it resizes itself.

It uses the System Sprite memory, so if you want – and have enough ram – you can have both Memphis and a ram disk on your iconbar at the same time.

The benefits of Memphis to people with meagre ram is that it only uses what it needs, automatically increasing and shrinking the sprite area – though only when the system allows. It never goes smaller than the configured SpriteSize and only shrinks when deleting.

You can increase your sprite areas before indulging in operations during which it cannot grow – like *COPY, which claims all free memory.

The Memphis filing system will let you have up to 30 characters in a file name – on RISC OS 3 – but you still won't be able to read all the name in a Filer window so it's your decision whether or not this is a useful feature.

● *Seasons greetings in musical form*

Finally, remember PowerCarols? Well it's that time of year again, and James Coates of Different Ideas Music, has with Mark Walters produced **PowerCarols 2: The Revenge**. This PD musical extravaganza is accompanied by a snowman who will jump in the snow if you click on the iconbar.

PD LIBRARIES

8-BIT HOUSES

8-bit Software, 17 Lambert Park Road, Hedon, Hull, East Yorkshire HU12 8HF.
BBC PD, 18 Carlton Close, Blackrod, Bolton BL6 5DL.
HeadFirst PD, 97 Chester Road, Southport PR9 7HH.
JJF PD, 49 Hollyberry Close, Winyates Green, Redditch, Worcester B98 0QT.
Mad Rabbit PD, PO Box 4, Crigglestone, Wakefield, West Yorkshire WF4 3XE.
Masterdisc, 2 Seaview, Hoylake L47 2DD.
Welsh Boys PD, 88 Queen Street, Barry, South Glamorgan CF62 7EE.

32-BIT HOUSES

3PD Swapshop, 66e Picardy Road, Belvedere Kent DA17 5QN.
Alpine PD, PO Box 25, Portadown, Craigavon BT63 5UT.
APDL, 39 Knighton Park Road, Sydenham, London SE26 5RN.
Arcaynia, PO Box 1927, Sutton Coldfield B74 3QZ.
ArchAngel PD, PO Box 41, Exeter, Devon EX4 3EN.
Archimedes Fractal Group (AFG), 30 Bowen Drive, West Dulwich, London SE21 8PN.
ARM PD, 109 Woodland Drive, Cassiobury, Watford WD1 3DA.
ARMistic PDSL, 136 Wellesley Road, Ilford, Esex IG1 4LJ.
Craig Beech PD, 30 The Deerings, Harpenden, Herts AL5 2PE.
Datafile, 71 Anson Road, Locking, Weston-Super-Mare, Avon BS24 7DQ.
Datastream, 34 Norbreck Close, Great Sankey, Warrington, Cheshire WA5 2SX.
Different Ideas, Eyton House, Eyton, Leominster Herefordshire HR6 0AG.
Digital Phenomena, 104 Manners Road, Southsea, Portsmouth, Hampshire PO4 0BG.
DigiTech, 20 Downing Crescent, Bottesford, Scunthorpe, South Humberside DN16 3LS.
Eureka PD, 78 Rawlinson Road, Southport, Merseyside PR9 9NE.
Gem PD, 15 Partridge Down, Oliver's Battery, Winchester, Hampshire SO22 4HL.
HeadFirst PD, 97 Chester Road, Southport PR9 7HH.
LowCost PD, 6 Furzeland House, Sheephouse Way, New Malden, Surrey KT3 5PH.
Naked PD, Fayence, Fulford Road, Fulford, Stoke-on-Trent ST11 9QT.
Planet PD, 37 Manor Drive, Berrylands, Surbiton, Surrey KT5 8NF.
Skyfall, PO Box 2220, Birmingham B43 5RZ.
Swop It PD, 7 Salterns Terrace, Bideford EX39 4AG.
Westbourne Services, 34 Bradley Street, Wooton-under-Edge, Gloucester GL12 7AR.

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- Smart equation editor - you type the symbols and choose the functions, it does the rest (TechWriter only).
- Easy to use table editor (not in StartWrite).
- Hot link to Desktop Thesaurus from Risc Developments Ltd (not in StartWrite).
- Speech synthesis (StartWrite only).
- Fully RISC OS compliant.
- Uses RISC OS printer drivers.

Prices

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TechWriter v2.0	*£199*

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EasiWriter v3.0

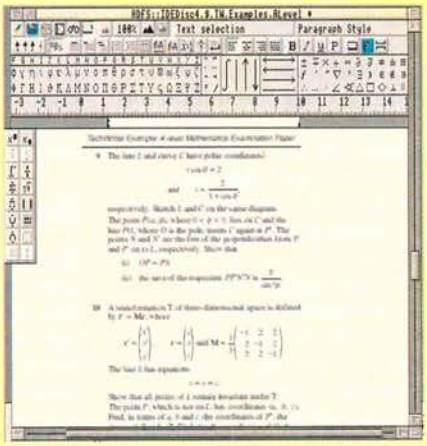
Modern word processors let you do wonderful things with text and graphics. Text can be typed in a bewildering variety of fonts and font sizes and displayed on screen exactly as it appears on the printer.
This is all very well, and certainly enables you to produce professional looking documents. The trouble is that all you really want to do is type words and not be bothered with fiddly typographical details.
EasiWriter has been designed to let you do just that. You just choose the sort of structure you want - chapter, section, table etc. - then type the words. What could be simpler? Once you've experienced its capabilities you won't settle for less.

Text selection
Paragraph Style
The Effects of Alcohol Intoxication on the Proprioceptive Feedback Mechanisms and Motor-response Capabilities of Gerbils

"I would recommend EasiWriter as the best RISC OS word processor."
Mark Webb – Archimedes World

TechWriter v2.0

Do you ever write documents that contain mathematical equations? If so, then you probably type the words first and add the equations later by hand. And no doubt you often dream of the day when you will be able to type the equations along with the words. Well, now you can stop dreaming because TechWriter has turned the dream into reality. We have taken all the features of EasiWriter and to these we have added a powerful equation editor that automatically applies the rules of mathematical typography on your behalf. All you do is choose the functions and type the symbols. TechWriter does the rest. Use it to produce exam papers, worksheets and technical reports with unrivalled ease.



"... for producing technical and academic documents TechWriter is nothing short of excellent"
Graham Bell – Acorn User

StartWrite v2.0

Just for a second imagine all the plus points of EasiWriter simplified into an entry-level word processor.
Well, that is precisely what StartWrite is all about. It has a 'point and click' button bar, Drag and Drop editing, WYSIWYG display, can import sprite and Draw files, and has an 80,000 word spell checker.
And it can talk! With a copy of !SPEECH from Superior Software or SpeechSystem from P.E.P. Associates, StartWrite can say words as you type them. It can even pronounce the guesses that the spell checker produces. Research shows that talking word processors can improve reading age and spelling ability.

Tutorial Exercise
All About the Phoenix
The phoenix is not a real bird but many stories have been told about it. It is said to live for 97,000 years. Only one bird lived in the world at a time. There could be no others.
Its feathers were red and gold, the same colour as the sun.
When the phoenix was about to die, it would build a nest of branches and set fire to it. The bird was

"If you want a simple, no-nonsense word processor with graphics... StartWrite will not disappoint"
Mark Sealey – Educational Computing & Technology

The short list

Pam Turnbull and Clem Vogler look at some useful and unusual programs which could nicely fill your Christmas stocking

RISC OS 3 First Steps by Anne Rooney: A prayer is answered

THIS is an ideal beginner's book, ranging widely, but not deeply, into pretty well every avenue open to RISC OS users. Much of the book covers things dealt with in the User Guide, but the aptness of Anne Rooney's style is what justifies repeating them.

She reorganises the presentation, amplifies some skimped detail, pares away repetitive or confusing material and renders the whole in concise, grammatical, jargon-free prose.

A well chosen selection of RISC OS operating system commands introduces the half dozen you actually need to know about if you work from the desktop and ignores the rest.

If you have puzzled over the need for a !System directory or wonder what size you should set Font Cache to, you are the natural target of this book. In addition you'll progress much faster than by relying on the User Guide.

Where this book goes beyond the User Guide is in its coverage of related topics. There are useful, though superficial, chapters on communicating with PCs and other micros, on networking and on so-called Special Needs features for disabled users. There is a summary of the types and uses of hardware cards and peripherals.

Seasoned users of RISC OS will not find much new material here but they may still benefit from the clear presentation, with things you vaguely knew about falling into context. You discover the odd detail you ought to have known, but didn't. I hadn't realised that you can *move* a file by holding down Shift as you drag it – and it can be quicker.

This is another volume in the DABS Press series, but departs from the wide margin style of earlier guides with longer text lines on shorter pages. The uncluttered layout and effective use of screen illustrations is retained but the chapter introductions and summaries, which I praised in the companion *Impression Guide*, have been dispensed with.

Accuracy is another virtue of the material in this book. When struggling with something new the last thing you want is a trip up the garden path after some factual mistake.

The only error I could find was where she said *Acorn Computing* used to be called *A&B Computing*. We're magnanimous enough to overlook the slur, and thoroughly recommend *RISC OS 3 First Steps*.

PRODUCT SPOTLIGHT

Price: £14.95
Supplier: Dabs Press, 22 Warwick Street, Prestwich, Manchester M25 7HN.
Tel: 061-773 8632

Card_Shop: DIY flair

IF you are looking for a program for children that's more leisure than education orientated – but not a game – look no further. Card_Shop is an excellent little program which parents and kids will have hours of fun with, needing little supervision and producing great results. Although you will need a printer.

In simple terms Card_Shop lets you create your own cards for any occasion (as well as the envelopes and the stamps – though I don't think the Post Office will honour them.)

You print out the results and, with scissors and glue, put the masterpiece together. You can opt for mono designs if you want add your own colour once printed.

Card_Shop offers you four design modes: The front picture and words, the inside message, the envelope with address and the stamps. You start in *Card mode* and the window shows a display area of the front of the card. To change mode just click the icons to the left.

For your card front you can have pictures and/or borders by just click the relevant icon. Your picture can be a sprite or drawfile but borders can only be drawfiles.

There is a good selection of pictures and you can add your own from clipart or create your own sprite and drawfiles. There is a selection of Sherston clipart on the disk to show you what's available.

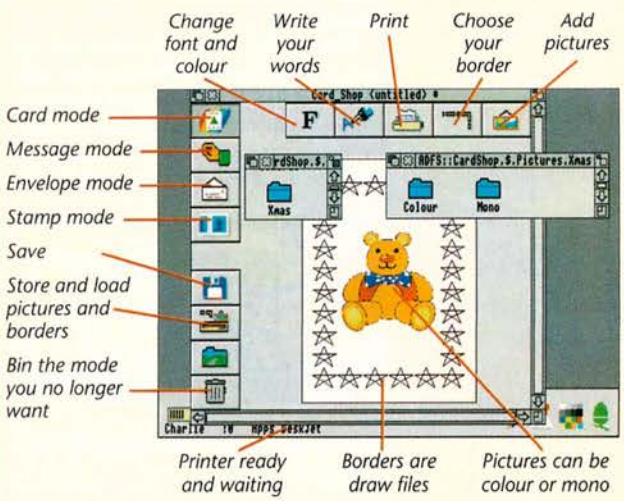
When it comes to the text on the card front and inside, you can change font and colour as you wish. In addition a spelling list appears to help with awkward words – you have to type in the words so reinforcing the learning process which is a nice touch.

In stamp mode you're given three rows of stamps which you can leave at the default of 20p or change value and currency as you see fit.

Card_Shop has proved a great hit with young and old alike and at the cost it certainly has a much longer lifespan than a game for the same price.

PRODUCT SPOTLIGHT

Price: £24.95 (inc VAT)
Supplier: Clares Micro Supplies, 98 Middlewich Road, Northwich, Cheshire CW9 7DA.
Tel: 0606 48511



Mummy: Learn from the ancients

PRODUCT SPOTLIGHT

Price: £15
Supplier: Emerald Publishing, 166 Shelford Road, Trumpington, Cambridge CB2 2NE.
Tel: 0223 840138

I AM always surprised by how many people are interested in ideographic languages from Japanese to Aztec – just watch the adults cribbing the writing and numbering systems from Sherston's Aztecs – to the Chinese and Egyptian varieties.

Emerald were responsible for Hanzi, reviewed some months ago, and now comes Mummy, their hieroglyphic system.

This version is aimed at primary schools working on the NC option on Ancient Egypt, but at the price is a useful program for anyone interested in Egyptology. Emerald are working on a fuller version including all 750 hieroglyphs in Gardiner's classification.

What you get at present is a multi-tasking program which provides two libraries to toggle between, Phonetic and Ideogram. In all there are 24 alphabetic hieroglyphs, plus some to represent sounds.

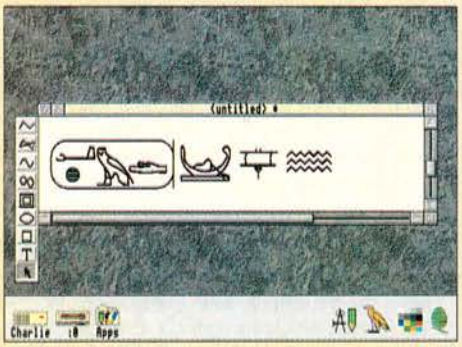
The symbols for numbers are also there as are some *determinatives* or symbols for nouns such as house although some are modified nouns and verbs – a total of 79 hieroglyphs. It does sound a little confusing but is quite logical. Also names are boxed or put into one of the two sizes of *cartouce.*

Taken at face value it is not surprising that the Rosetta Stone was considered to be unreadable when it was first discovered. Comprehension is not aided as hieroglyphs can be written left to right, right to left or top to bottom. To find out which, look at the faces of the symbols as faces always point towards the beginning of the text.

To add even more confusion Egyptian scribes would arrange the exact placing to get the most pleasing effect. Say you had two short symbols side by side, they would more likely be placed one on top of the other so that they more nearly occupy a square.

For this reason you use Draw to place the hieroglyphs, dragging and dropping them in your Draw window where they can be rotated, coloured and so on.

The slim manual explains what you need to know including how the numbering system worked based on hieroglyphs for 1, 10, 100, 1,000, 10,000, 100,000 and 1,000,000. You don't have to remember everything as two drawfiles are included on the disk giving the meanings, sounds and definitions associated with the ideograms. All in all a fascinating little program.



● *The beginning of a story about the travels of Ahmed*

● *The meanings of the hieroglyphs displayed in the ideogram window*

Knowledge Organiser II: Organising your thoughts

PRODUCT SPOTLIGHT

Price: £99.95 (inc VAT)
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Tel: 0606 48511

DATABASES come in various formats, some more suited to particular tasks than others. Knowledge Organiser is one I wish I had had when studying history at university, as it is perfect for managing large amounts of text and testing suppositions and ideas and is especially at home on a portable A4.

The manual is well constructed, so even if the prospect of finding your way around a free form relational database fills you with horror just follow the step by step tutorial and you'll soon get the hang of it. There are sample files and text on the disk and a read-only version of the software should you wish to pass your hard work on.

The starting point is the Linker window where fields are created and data is entered and displayed. KO2 has been designed to be quick and is a program which really benefits from a multi-tasking environment.

Once you have decided on your subject you set up the program with a series of Context and Source references. This is basically creating an index from collected data using personally selected key ideas and key words. For instance *wealth*, could have a Context code WEA and the Source could be Benjamin Disraeli BD.

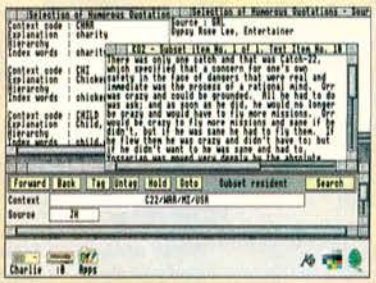
Items of text can be related to more than one Context. So as you browse through entries the current Context field may look like this: C22/WAR/MI/USA telling you that this particular item relates to Catch 22, war, mental instability and the United States.

Simply everything can be customised and changed, explanations added and information exported elsewhere as text.

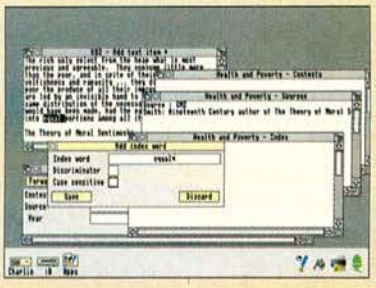
I was surprised how quickly ideas and research can be added and cross referenced and just how open KO2 is. Much of this is down to the excellent manual.

You can search on particular ideas, or on sources – authors, political theorists and so on – or on certain words, or individuals, making the search as wide or narrow as needed. The normal database functions such as wildcarding and subsets are available.

If you are interested there is a section of the theory behind KO2 but for me the usability is all important.



● *Information of your fingertips*



● *Creating a database is quite straightforward*

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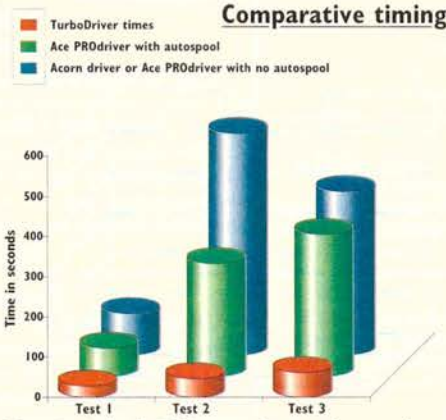
The bottom line is that if you value your time, the TurboDrivers are for you - they can render pages and give control back typically at between three and ten times faster than Acorn printer drivers or Ace PROdrivers. Indeed once the image has been rendered then the printing continues entirely in the background - as fast as the printer will go. This makes a large difference for just one page and an enormous difference if you are printing more than one copy of each page.

Comparative timings



Test 1 - A single DTP page of text and scanned graphic images

Test 2 - Two copies of a three page text and graphic document

Test 3 - A complex full page of graphics from ArtWorks

The timings indicate the time in seconds to get control back. All tests performed on HP DeskJet 500 printer using a 4Mbyte A440 with an ARM3 fitted. Other machine combinations show similar performance gains.

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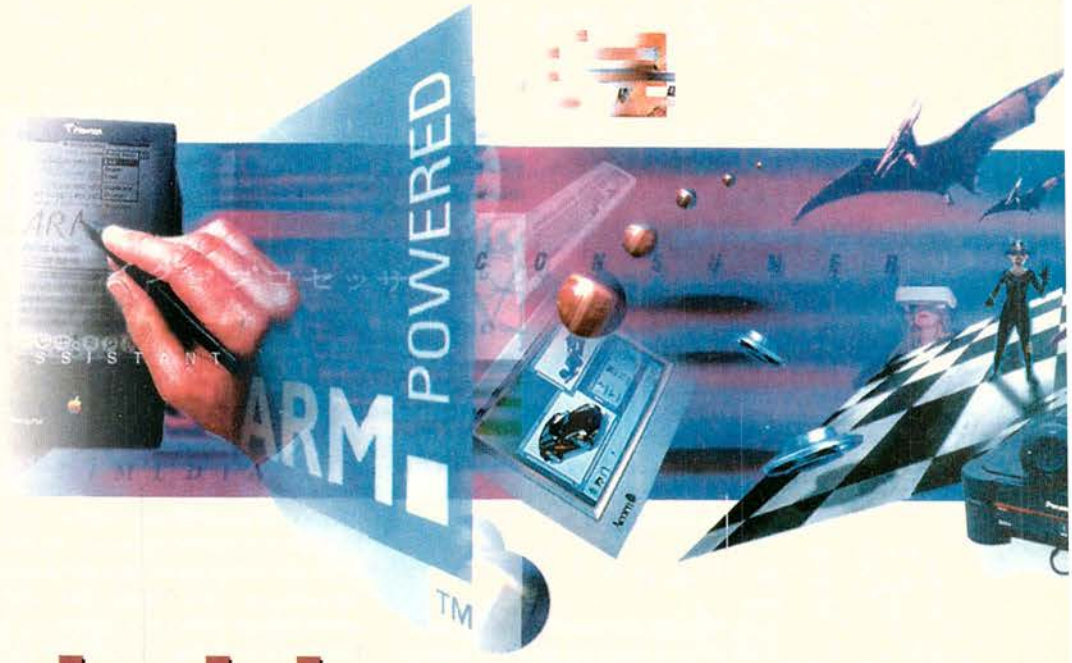


RISC worth taking

Mike Cook, Amit Gupta and Steve Turnbull explore the powerful ARM chip, its past, present and future

EVER since Acorn's announcement of its ARM processor back in 1986, Reduced Instruction Set Computers (or RISC chips for short) have constituted the biggest single advance in computer design since the advent of the microchip itself.

What started out as an interesting research exercise has grown into the acknowledged way forward for the computer industry.

Many people are already aware that the RISC philosophy involves reducing the number of instructions built into a chip and that this is somehow connected with an increase in processing speed.

In fact the reduced instruction set is just one of a number of techniques which, when taken together, comprise a radical departure from traditional CISC (Complex Instruction Set Computer) design.

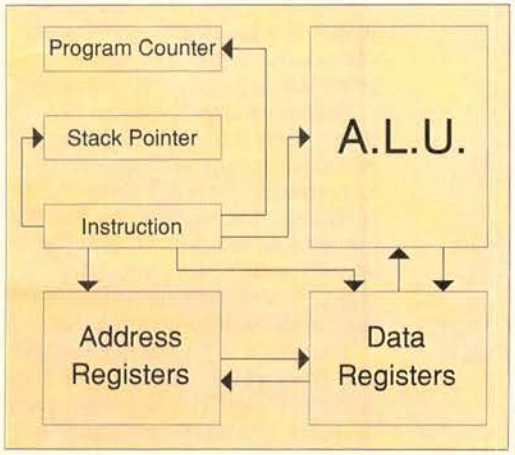
A microprocessor itself is quite a complicated beast and is made up of several distinct parts, as you can see from Figure I. The arithmetic and logic unit (ALU) is the core of the processor and performs operations such as addition and logic functions.

A bit of processor theory

The registers can be thought of as just like memory cells, except that, because they are built on to the actual chip, they are faster to get at than memory.

Several types of register are present on the chip: Address registers hold memory addresses and data registers hold numbers ready for input into the ALU which will usually return a result in another data register.

In addition, three special registers are provided – the instruction register holds the instruction currently being executed, the stack pointer is used when subroutines are required and the program counter holds the address of the current instruction.



● *Figure I: The arithmetic and logic unit is the core of the processor*

A salient feature of this type of architecture is that the processor always goes to the next instruction in memory unless told otherwise by, for instance, a command telling it to go to a specific location.

This system is known as the Classical Von Neumann architecture, and almost every modern processor, including the ARM, uses it in one form or another.

The process of executing an instruction is not quite as simple as it sounds. It is best to think of it as comprising three distinct stages.

First, the instruction has to be fetched from main memory and stored in the instruction register on the chip.

It then has to be decoded, a process which involves examining the instruction and deciding what needs to be done – for example, adding the contents of two data registers together and placing the result in a third, or jumping to a specified memory address.

Finally there is the execution stage, where the command is actually

carried out and any results written back into the registers.

A conventional microprocessor such as the Motorola 68000 will typically support around 100 instructions covering a wide variety of operations such as arithmetic with and without carrying figures, loading and storing of values, moving data between registers and jumping to locations in memory.

Some of these instructions will be conditional. For example, if there were an instruction

```
add a,b,c
```

meaning add the contents of registers *a* and *b*, and place the result in register *c* there might be another instruction

```
addmi a,b,c
```

which would carry out the addition only if the result of the previous calculation was minus; that is, negative.

We would therefore expect to find several different addition instructions, each of which would be used in certain conditions; and when you remember that many other instructions can be treated in the same way, it isn't difficult to see where the figure of one hundred comes from.

Although the computer acts on whole instructions as shown above, these are not what is directly wired into the processor. In fact there is another layer of program called *microcode*, whose instructions are even more primitive than machine code and which cannot be programmed directly.

Each processor instruction gets translated into a sequence of microcode during the decoding stage, with the microcode then being executed. It is worth noting here that microcode makes a processor much easier to design, since microcode is simpler to implement, in electronic terms, than machine code.

Although by any standards most of the instructions on a typical chip appear comparatively simple, some – such as division and memory accesses – are more complex than others in terms of the microcode implementation, and will hence take longer to execute than others.

To measure the efficiency of a processor we therefore need some method of quantifying exactly how long an instruction takes to execute.

All the components in a computer are connected to a system clock, which emits voltage pulses at a regular frequency, and they can only be active when they start receiving a pulse.

The idea behind this is to ensure that the operation of all components is synchronised, because they are all connected to the clock, they all spring into action at exactly the same time.

Each instruction on the chip will take a certain number of clock cycles to execute, the more clock cycles required, the slower the instruction. Note that all three stages of processing – fetching, decoding and executing – will require clock cycles.

A typical Motorola 68000 instruction requires around 10 clock cycles to process; so with a clock frequency of 7.14 MHz – as it is in the Commodore Amiga – we get a speed of around 7.14/10 = 0.71 million instructions per second, or 0.71 MIPS.

So although the Amiga has special hardware for speeding games up, its raw processor power doesn't really compare with the 6 MIPS of an Acorn A3010, more like the 0.5 MIPs of the old 8-bit BBC Micro.

The first ever *official* microprocessor is generally held to be the Ferranti F100, which was unveiled in 1969 and in itself marked the beginning of the silicon revolution. Although other devices had appeared before then, the F100 is regarded as the first which truly deserved the name microprocessor, since it included many of the features described above, such as a stack pointer and an ALU.

Some years later came the next major landmark, the Zilog Z80, which bore a strong resemblance to the modern devices of today. It was one of the first devices which could be linked to a memory and a display to form a proper computer, and it was extensively used in the very first generation of home computers, which included such venerable names as the Sinclair ZX81 and the early Amstrad PCW.

More complexity

The development of the Z80 spawned the Motorola 680x0 and Intel 80x86 series, which are the most popular processors today.

Despite some very clear differences between the above processors, each achieved a greater throughput than its predecessors by increasing the number of instructions supported on the chip. The reasoning behind this – which seemed perfectly valid at the time – was as follows:

Any task which a computer performs will be made up of a number of sequential instructions. By increasing the repertoire and complexity of the instructions, it might be possible, it was thought, to combine several fairly simple instructions into a single bigger instruction. Therefore less instructions would be required in the program, which translates into faster execution.

During the late '70s and early '80s this idea of complex instruction set computers (CISC) became the foundation upon which all processors were conceived.

The microcode system was invented to facilitate the addition of new, more complicated instructions – adding a new instruction was now simply a matter of organising the appropriate microcode, just like writing a procedure in a high-level language.

Instruction sets developed to a point where it was common for processors to support hundreds of instructions, with each being highly specialised; for example, the 68000 contains no less than 12 different ways of moving data between registers, with each instruction being used under different conditions.

The syntax of the instructions was also developed to support many of the features of high-level languages, such as strings, procedures and arrays, in

The man behind the Amulet

Professor Stephen Furber moved to the Computer Science department of Manchester University in 1990 ,having decided to move on from Acorn where he had worked for many years.

At the time he hadn't planned to move into asychronous microprocessor design but after reading a pivotal paper by Ivan Sutherland called *Micropipelines* he became very interested in the area and decided to see if it were possible to build a single-chip microprocessor that would work.

The theory was all very well and it had certainly been achieved in mainframe computers – the MU5 computer built at Manchester University was just such a machine – but to do it on a microprocessor? There was a challenge.

About this time ARM Ltd were producing their ARM6 series of chips – used by Apple in their Newton hand-held unit – and Professor Furber chose the ARM610 as the basis for his asynchronous chip.

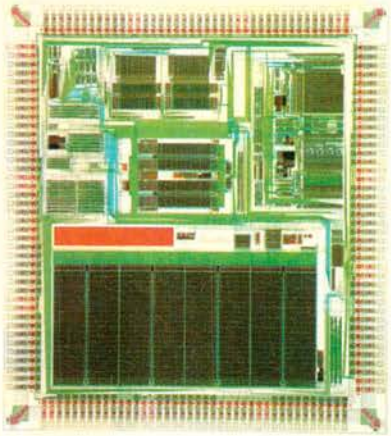
Now, a couple of years down the line, the first prototypes in silicon are rolling out of GEC Plessey to be tested to see what kind of performance they can turn in. The Amulet has about twice as many components as the ARM610 because each section of the processor needs its signalling interface.

One of the primary features of ARM processors is that they are incredibly simple and use very few components on the chip – the new ARM700 processor has a mere half-million (which includes the 8k on-board memory cache) compared to, say, the Intel Pentium which has three million components and in processor design more is not better.

There are no plans for a commercial version of the Amulet as yet, Furber and ARM Ltd made it quite clear that while they are working closely together there's still a lot of research to be done first to ensure the design works, to see how well it functions and if it fulfills its potential. Then the overall design must be simplified to reduce the onboard components.

Steve Turnbull

● *Professor Stephen Furber in his labs with the giant-sized layout of his Amulet asynchronous ARM chip.*



● *The complete ARM700 microprocessor as produced by GEC Plessey – it starts shipping in April 1994*

order to make the life of programmers easier. For a similar reason the registers on a processor were divided into Address, Data and Stack registers, to obviate the need for programmers to do the job themselves.

The CISC approach also brought with it another tangible advantage in terms of memory. Because a particular program would require fewer instructions, it would also require less memory.

In the days when memory was incredibly expensive and the capacity of chips was measured in bytes rather than kilobytes, this was an extremely important factor.

Furthermore, the use of long instructions – commonly 50 clock cycles, and up to 118 clock cycles on the 8086 – meant that the memory could afford to be slow, since it would be accessed less often, a very important factor given the state of contemporary memory technology.

Calculated RISC

The first steps towards changing this state of affairs came chiefly out of the results of a 1976 research project which was initiated by IBM in collaboration with groups at the universities of Harvard and Berkeley. The project was set up as a general investigation into processor architecture, with the aim of developing a strategy for future generations of computers.

Despite its many advantages, the researchers identified three fundamental flaws in the CISC methodology. Firstly, although the wide provision of instructions was intended to produce easier programming, it was found that in practice most of the more exotic instructions simply never got used.

Programmers relied on just a small subset of the available instructions, and would emulate larger ones by putting the smaller ones together – they simply didn't have the time or patience to master the full instruction set. In fact, the enlarged range of instructions was often found to be counterproductive, as programmers struggled to memorise the fifteen different ways of saying A+B=C.

Secondly, what was even worse was that it was often found to be quicker, in terms of clock cycles, to replace a long instruction by several shorter ones. This was an inevitable consequence of trying to implement highly sophisticated instructions in the essentially primitive microcode, and of course defeated the whole point of CISC architecture – to reduce the number of instructions in a program.

Thirdly, and most importantly, the researchers saw an impending conflict between the complexity of a chip and its heat dissipation. Any electrical circuit, no matter how tiny, generates heat; the more components which are present, the more heat is generated. In a complex processor with a large number of components, the heat is great. Combining this with the fact that continuous advances in semiconductor technology meant that components were getting much closer together, it was possible that a chip could malfunction or even burn out due to excess heat dissipation.

The researchers therefore set themselves the task of devising an alternative design strategy for a new generation of microprocessors. They came up with RISC – the Reduced Instruction Set Computer. The idea was to remove from the design all the instructions which were only rarely used and to simplify the remaining instructions so as to enable them to execute in as few cycles as possible – ideally a single clock cycle each.

The overall design of the processor would also be simplified in order to reduce the component count. For example, all processing instructions would operate only on registers. A small group of dedicated instructions would be provided to load and store data. And microcode would be abandoned. Each instruction would be directly hardwired into the chip; a feat which was again possible, since the instructions were now much simpler than before.

The theory was that, although a

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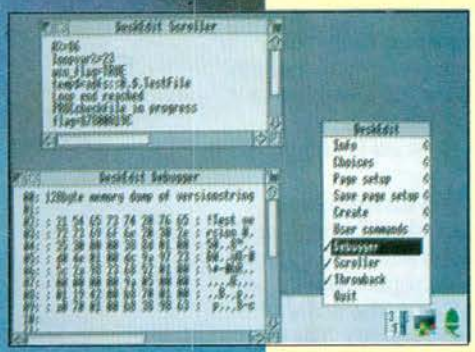

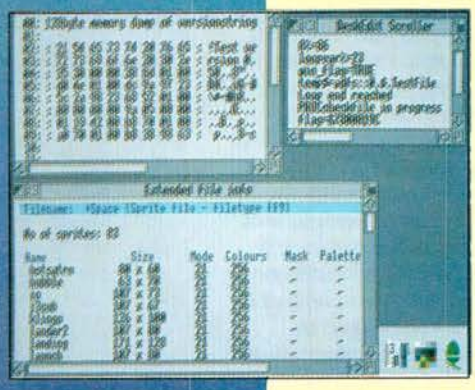

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RISC developments

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processor based on such a design would require more instructions to implement a particular operation, it would be more adaptable in use, since the simplified instruction set could be tailored exactly to the needs of the problem in hand.

And because the discarded instructions were the ones which programmers didn't bother using, they wouldn't notice the difference anyway. Furthermore, a reduction in the number of components on the chip meant that they could afford to be spaced out more on the silicon, which meant that the chip could be run reliably at higher clock speeds.

With a new, simpler processor, the goal of having each and every instruction execute in a single clock cycle was now feasible. However, the fetching and decoding stages would also still take at least one clock cycle each.

This meant that each instruction would take at least three cycles to process in total – much better than a conventional CISC processor, but quite far from the ultimate ideal of one clock cycle total processing time.

In the pipeline

It was mentioned earlier that the circuitry for each of the three processing stages is held in three separate parts of the processor. Although all three parts are equally important, the Harvard researchers realised that during any clock cycle only one of the three sections is active, the other two are sitting idle, waiting to be given something to do.

For example, while an instruction is being fetched, the decoding and executing sections can't be used, and while the same instruction is being executed, the fetching and decoding sections are waiting for the next instruction. It was thus clear that at any one time, around two thirds of the processor wasn't doing anything.

To improve this situation, the engineers came up with the concept of pipelining, illustrated in Figure II. Here, the first instruction is fetched as normal, but while it is being decoded, the second instruction is being simultaneously fetched, and while the first instruction is being executed the second is being decoded and a third instruction is being fetched.

In this manner, the processor is actually dealing with three instructions at a time, and so utilising its full capacity. In high-end machines it is not uncommon to find five or even, as in the DEC R4000, a seven-stage pipeline.

Since each clock cycle causes another instruction to exit the pipeline, we are effectively processing one instruction per clock cycle; so we have exactly tripled the speed of our previous model at a stroke.

Or have we? The problem with the above idea is that it assumes that the instructions in a program will all be executed in strict sequence. In practice this rarely happens, although there may be long chains of consecutive instructions, there will also be branching instructions which tell the processor to jump somewhere else in memory, thus disrupting the pipeline.

In this case the pipeline has to be flushed (cleared) and the processor starts again from the new location. The actual speed improvement is clearly, therefore, slightly less than triple. In many cases branching is done forwards through the code in order to skip instructions:

```
1. Test Value
2. If Result = 0 then jump to 5
3. Do something
4. Jump to 6
5. Do something else
6. rest of code...
```

Here, depending on *Value* the instructions will be executed *1 2 3 4 6* or *1 2 5 6*. It's possible to avoid these frequent short jumps by making *every* instruction conditional so they always feed sequentially into the pipeline but, depending on the condition, may not be executed, like this:

```
1. Test Value
2. Do something if Result # 0
3. Do something else if Result = 0
4. rest of code...
```

As you can see the code is always executed *1 2 3 4*, but either instruction 2 or 3 will be ignored depending on the result. Jumping forwards is still allowed and if it's a jump that's far enough it will be quicker than loading then ignoring a sequence of instructions. Jumping backwards still requires a break in the pipeline.

Enter the ARM

Acorn's own RISC project was initiated in 1983 from within their Advanced Research and Development Division, under the guidance of Steve Furber and Roger Wilson. The aim of the project was to exploit flexibility as well as speed – to produce a chip which, by virtue of its simplicity, could be used over a wide range of applications without sacrificing suitability or cost-effectiveness.

	FETCH	DECODE	EXECUTE
CYCLE 1	Instruction 1	—	—
CYCLE 2	Instruction 2	Instruction 1	—
CYCLE 3	Instruction 3	Instruction 2	Instruction 1
CYCLE 4	Instruction 4	Instruction 3	Instruction 2
CYCLE 5	Instruction 5	Instruction 4	Instruction 3

● *Figure II: How pipelining is implemented*

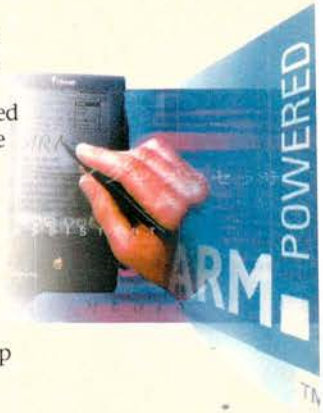
Instead of building separate devices for differing needs, a single, more universal design would exist which could then be readily adapted to a particular set of requirements.

To fulfill such a target the processor would have to be quick to design, modify and expand, in order to meet the target of adaptability. It would have to be capable of interfacing with existing memory and peripheral devices, to retain cost-effectiveness.

Above all, it would have to be cheap enough to be used in an ordinary home computer – a market which had been held to be impenetrable for such an advanced technology.

It is a philosophy which has proven to be remarkably successful. The processor – the ARM – was designed in only 14 weeks, contained a mere 28,000 transistors with just 44 instructions and ran at up to 5 MIPS, several times faster than the fastest available processors of the time.

In 1986 three support chips were designed and built providing video, memory management and I/O control, and in 1987 the ARM2-based Archimedes 300 series appeared, the first ever home computer to utilise RISC technology, and with a ridiculously low price at under £1,000.



Two years later came the ARM3 with the promised on-board cache (a small piece of very fast memory built on to the chip which speeds up loops in code), and 1990 saw the transfer of all ARM research and development to a new company, ARM Limited, in which Apple Computer Inc also bought a 40 per cent stake.

There is now a whole family of ARM chips, with speeds of up to 30MIPS with designs for an ARM8 series that will run at up to 100MIPS,

and it is certain that future developments will come from there rather than from within Acorn itself.

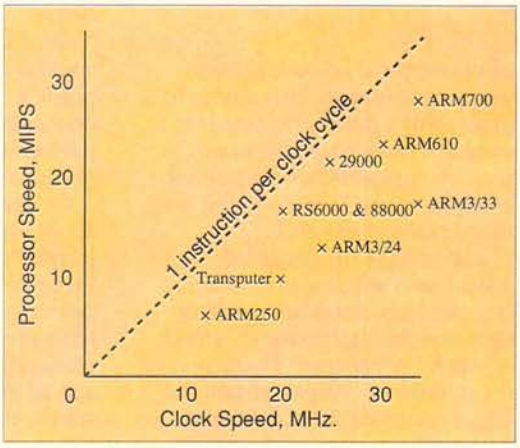
And finally...

The rest of the computer industry is now slowly waking up to the benefits of RISC technology. Both Intel and Motorola boast of the *RISC-like* features incorporated in their 80486 and 68040 chips respectively.

IBM has long since picked up on its original project to produce the RS6000 chipset, and there are now many RISC devices on the market, as the table shows.

Figure III illustrates the relationship between clock speed and processor speed for all these chips bar the last two, whose remarkable performance relies on techniques beyond RISC design. However, the ARM is still the only processor cheap enough to be used inside a home computer and this state of affairs is likely to continue for some time yet.

● *Figure III: Approaching the idea of one instruction per clock tick*



The flexibility of the ARM means that it has also made inroads into control applications and computers by other manufacturers. GEC Plessey uses ARM chips inside defence monitoring equipment, and Apple has been utilising ARM technology extensively, the first two products of which is the Newton personal organiser and a CD-based family entertainment system which is said to be their answer to Commodore's CDTV.

Amit Gupta

The clock stood still

THE buzzword in the ARM world at the moment is *asynchronous*, a lot of people have talked about it and a lot of false assumptions have been made. So just what is an asynchronous processor and why is it important – if it is important at all?

To start with you have to know how conventional or *synchronous* processors work. All the operations of these processors is under the strict control of a clock signal, normally derived from an external crystal oscillator.

Everything is related to this clock signal and it governs the *throughput* or processing power of the computer. If you double the clock speed you will double the speed of the system. At least that's what happens in a simple system. In todays modern systems some components of a computer are capable of running much faster than others.

For example, in Acorn machines there is a difference in access times for instructions held in ram and those held in rom. In order to compensate for this you have to keep the processor hanging on by introducing wait states.

A wait state is simply an extra clock cycle where nothing happens. Some wait states are built into the processor architecture and others can be manufactured externally with delay lines and logic. This can get quite complex and all the delays must be in increments of a whole clock cycle.

Here's where an asynchronous design comes in: There is *no clock*. In theory every section of the processor operates as fast as it can. This means however that the communication between the various parts of the processor has to be a lot more sophisticated than in a clocked design.

For example, a processor would normally perform an instruction fetch by placing an address on the address bus, setting some control signals and then reading the data bus. These actions would be separated by time derived from the clock so the processor would assume that the memory contents had been placed on the data bus in time for it to be read.

In an asynchronous design the processor would place the address on the address bus and then signal the memory it wanted a read. It would then go and do something else until the memory signals back that it was ready with the data.

But it goes even further than that because each separate section of the processor is independent and communicates with the others using signals.

Normally changes in signals are dependent on *levels*, a high voltage might mean the signal is on while low means off. This means that to send a signal the voltage must go up and then come down afterwards before it can go up again.

In the Amulet chip designed by Steve Furber, all this signalling is done with logic *transitions* and not levels, it means that a *change* occurred, the voltage went from low to high or from high to low.

In fact the logic levels carries no information at all, a signal line just flips state to indicate it is ready. This is important because it avoids the time needed to reset to the *no*

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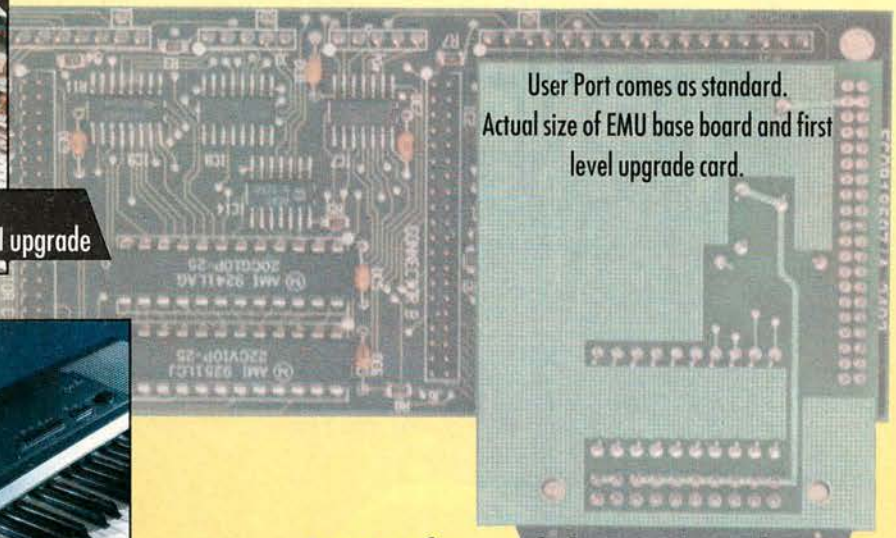

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signal level.

The asynchronous concept gives a *potential* increase in processing power because each part of the machine operates at its maximum speed, nothing is artificially limited by clock speed. But I say potentially because the power increase is not necessarily realised in practice.

What happens is that you find the system backing up at a bottleneck – the slowest operation, or the one most frequently required – and this is usually the one that determines the maximum rate of the clock in the conventional design. So why bother?

Power-down

Well the throughput is not the only thing computer designers are worried about when it comes to real products, there are other considerations most importantly *power consumption*.

Now the power consumption is not particularly important in a desktop computer but in laptop and palmtop computers it can make all the difference between a useful or useless product.

In the laptop world with standard processors you want to squeeze every extra second out of a battery's life. There are quite a few tricks that you can do to reduce the power consumption like not spinning the hard disk when you don't need it.

You will find also that if you reduce the clock speed of a CMOS chip it will draw less current – it's the changes in logic state that pulls the power. So you have a direct relationship between power consumption and processing power.

However, a lot of the time you don't need much processing power, for example the computer is just waiting for you to type the next letter. Therefore a great many laptop computers drive the chip with a variable clock rate, pumping it up when processing is demanded and down when there is not much going on.

The problem with this is that you can only speed up the processor in increments tied to the clock speed, and there is a mismatch between the speed needed and what you can get.

With an asynchronous design the more work you are doing the more changes in state you have and the more current is drawn.

When things quieten down then so do the changes in state and so the current drops. The power consumption matches the work load – but there is still another trick you could pull with an asynchronous design.

The basic limiting factor in any design is known as the propagation delay, this is the time it takes for a change in the input states of a logic gate to be reflected on the output state.

With CMOS this propagation delay changes with voltage. I like to think of them as a cold-blooded lizard, when they're hot – running off a high voltage – they are quite fast and agile, when cold (low voltage) they are slow and lethargic.

So you could run an asynchronous processor off a varying voltage, lowering it when little throughput is needed and upping it when you want to fly. There is a further advantage in this scheme: Whereas the changing the clock speed produced a linear saving of power, dropping the voltage produces a squared saving. That means dropping the voltage by half does not halve your power consumption but reduces it to a quarter.

The other exciting aspect of this project is that if you design the silicon correctly you can get the operating voltage down to about one volt. This opens up the possibilities of powering any device with a single cell battery.

To date, asynchronous designs have been concentrated on mainframe machines. The Amulet project is the closest anyone has got to implementing a RISC processor asynchronously. It offers the tantalising prospect of high-powered hand-held devices that don't conk out every few hours.

Mike Cook

Modern RISC chips

Company	Device	Clock	MIPS (MHz)	Comments
ARM	ARM250	12	6	A complete computer in itself used in the Acorn A3010, A3020 and A4000 machines.
Inmos	Transputer	20	10	Not really a RISC chip but is another British innovation. The parallel architecture allows multiple transputers (T400/T800) to be linked together and improve throughput.
ARM	ARM3	24	13	Basically ARM2 with 4k cache memory, used in older Acorn A5000s and in A4 notebook.
IBM	RS6000	20	17	Contains on-chip gloating point unit and can perform integer and floating point calculations simultaneously.
Motorola	88000	20	17	Not the fastest but a very flexible chip.
ARM	ARM3	33	18	Fast ARM3, used in newer Acorn A5000s.
AMD	29000	25	21	Highly reduced processor which contains 192 general purpose *cells* which can be partitioned into an arbitrary mix of registers, memory and cache.
ARM	ARM610	30	23	Improved ARM3 with better on-board memory management.
ARM	ARM700	33	28	Virtual memory support – to be used in the next generation of Acorn machines.
ARM	ARM800	?	>70	Still in design stages.
Intel	i860	50	150	Specially designed for graphics applications it contains on-board ray-tracing and shading hardware.
DEC	Alpha	75	450	Touted as the *Cray on a chip* the Alpha dissipates nearly 80W of power, the same as a household light bulb.

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Are you looking to upgrade your micro?

Stephen Wade examines the current Archimedes range

BUYING a computer is rather like acquiring a new car. You need to decide upon a particular manufacturer and make, then select the model which lies closest to your requirements. In many instances this will not incorporate *every* feature you had hoped for, and some customisation may be necessary.

On a car this could be the addition of a sunroof, towbar or rear spoiler. In the computer world additional memory, a hard drive or SCSI interface are common choices.

Acorn are no longer the only company to have released products based on the ARM processor – for instance, the Apple Newton includes the ARM610 – but they do remain the sole manufacturer of the Archimedes.

In many computer markets – particularly that of PC compatibles – the numerous suppliers all charge vastly different prices for identical specification machines.

The Acorn machines is priced much more consistently from one dealer to another. However, it is still worth shopping around as some suppliers offer say, a memory upgrade, from time to time at no extra charge.

The present Acorn range is based on five models – the A3010, A3020, A4000, A5000 and A4 – which cover a price range of £399 to £1999 (inc VAT) between them. But which is most suited to your needs? Let's take a look...

A3010: Power on a budget

Presented in a robust, space-saving single unit and packed with exciting features, the A3010 is the cheapest ARM-based machine – weighing in at an affordable £399 (inc VAT). With distinguishing green function keys and a large Acorn logo prominent on top of the grey casing, the design is smooth but quite a departure from the usual Archimedes style.

The basic model comes with a games-

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Software bundles

Action Pack – A3010 only

Acorn hope this package, the spearhead of their Christmas campaign, will put them back in the home (games) market which has been dominated by the 16-bit Commodore and Atari micros and games consoles in recent years.

There is a training cassette which enables even the newest user to get up and running in no time at all, a quality word processing package, one full game and four interactive demonstrations.

- *Audio training tape*
- *Full programs: Zool, Startwrite*
- *Demonstrations: Lemmings, Chuck Rock, Superpool, Fervour*

The Learning Curve – A3010/A4000/A5000

Often mis-interpreted as having a purely educational theme, The Learning Curve is aimed at helping a wide range of users achieve high productivity from their machine.

Software includes a feast of interactive demonstrations, the Advance integrated package (word processor/spreadsheet/database/graphing) and a PC emulator which turns your Acorn into a PC compatible, allowing DOS-based software to be run in a window on the desktop.

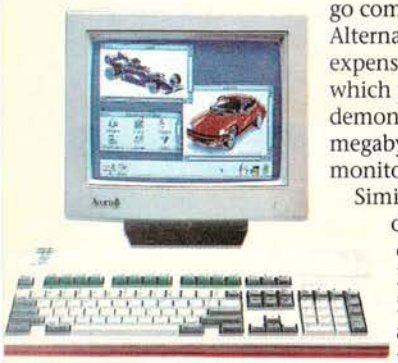
- *Audio training tape*
- *Full programs: Advance, PC Soft with DR DOS 6*
- *Demonstration software: Rhapsody II, Scoredraw, Voxbox, Fervour, Topographer, Darryl the Dragon, smArt, The Crystal Rain Forest, Naughty Stories, ArcVenture III*

Home Office – A4000/A5000

In many ways, the Archimedes is an ideal platform for use in business environments: It is versatile, easy to use and supported by a catalogue of professional quality software.

With the increased enthusiasm and confidence being shown in their products, Acorn have developed this package – which includes a word processor, database and integrated package – for small businesses and the home based professional.

- *Audio training tape*
- *Full programs: EasiWriter, DataPower, PipeDream 4, PC Soft with DR DOS 6*
- *Demonstration software: Prophet, Almanac*



based software bundle and can be used with any television set – formulating a low-cost, plug in and go computing solution. Alternatively, there is the more expensive Learning Curve pack which provides an array of mainly demonstrative software, an extra megabyte of memory and a colour monitor.

Similar to the ST, Amiga and, old BBC A3000, the disk drive resides in the right hand side of the case where it is easily reached. Unique among Acorn machines, two joystick ports are provided as standard, proving the leisure-oriented design.

Although targeted towards the younger family member, it is still very flexible and delivers the power associated with machines two or three times the price. As with more expensive RISC OS machines it can be applied to tasks ranging from education to professional desktop publishing. Certain applications may require additional ram or hardware which can be easily installed.

Accounting for inflation, the A3010 costs less than the Electron did at its launch 10 years ago – about half that of the original BBC Micro – and heralds substantially more memory, enhanced graphics displays, the friendly, easy to use RISC OS desktop and built-in high density (1.6Mb) 3.5in floppy disk drive.

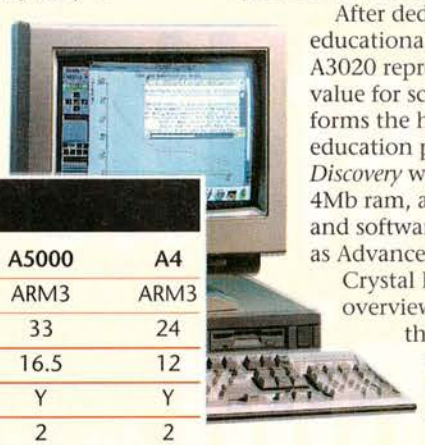


Table I: Specifications of basic models

	A3010	A3020	A4000	A5000	A4
Processor	ARM250	ARM250	ARM250	ARM3	ARM3
Clock speed (MHz)	12	12	12	33	24
Typical processing speed (MIPs)	6	6	6	16.5	12
RISC OS 3.11+ Operating System	Y	Y	Y	Y	Y
Main memory (Mb)	1	2	2	2	2
Main memory expandable to (Mb)	4	4	4	8	4
Floppy disk–1.6Mb (HD) formatted	Y	Y	Y	Y	Y
Hard disk (Mb formatted)	O	O	80	120	O
Econet network interface	-	Y	Y	O	O
Ethernet network interface	-	O	O	O	-
Parallel port (Centronics compatible)	Y	Y	Y	Y	Y
Serial port (RS232)	Y	Y	Y	Y	Y
IDE controller	O	O	Y	Y	Y
SCSI controller	O	O	O	O	T
Joystick ports	Y	T	T	T	T
Internal speaker	Y	Y	Y	Y	Y
3.5mm jack for stereo sound	Y	Y	Y	Y	Y
Mini expansion slots	1	1	1	-	-
Full expansion slots	-	-	-	4	-
Separate keyboard	-	-	Y	Y	T
PAL TV (UHF)	Y	Y	-	-	-
SCART TV	O	O	O	O	O
Analogue RGB (640x256) 256 colours	Y	Y	Y	Y	Y
VGA (640x480) 256 colours	Y	Y	Y	Y	Y
Multi-scan (640x512) 256 colours	Y	Y	Y	Y	Y
SVGA (800x600) 16 colours	Y	Y	Y	Y	Y
Built-in mono LCD (640x480) screen	-	-	-	-	Y

Notes

Y Fitted as standard
O Optional Acorn equipment
T Optional third party equipment

- Monitor quality dictates maximum graphics resolution
- Third party hardware to expand the 4096 colour palette to 24-bit is available for some models
- A German version of RISC OS is available

A3020: Educationalists' choice

Although this retains the styling of the A3010, its colour scheme reverts to the more familiar cream casing with red function keys associated with the BBC A3000 – in fact the A3020 in many ways is the cheaper, faster replacement for this educationally successful model.

The standard Econet interface replaces the joystick ports and the standard memory is a more useful 2Mb. This provides two and a half times as much *usable* workspace as can be found on a 1Mb machine.

After deducting the usual educational discount, the A3020 represents excellent value for schools. It also forms the hub of a special education package named *Discovery* which includes 4Mb ram, a 60Mb hard disk and software packages such as Advance, Magpie and The Crystal Rain Forest. An overview of this can be found in the October edition of *Acorn Computing*.

However, home users are unlikely to seriously consider this option because an A3010 Learning Curve provides all the same features – with the exception of network capability – for a lower price.

A4000: Styled for business

This model returns to the three box design preferred by most professional users and some educationalists. The main unit is supplied in a cream-coloured cantilever metal case which has a soft-grey plastic facia and is capable of supporting any monitor.

Because of its middle of the range positioning, the A4000 is targeted at four quite diverse markets. These are:

- Secondary education (an Econet interface is fitted as standard)
- Home-based professionals
- Small businesses
- Home users and hobbyists

While the Acorn machines are viable for business in their own right, most users still think in terms

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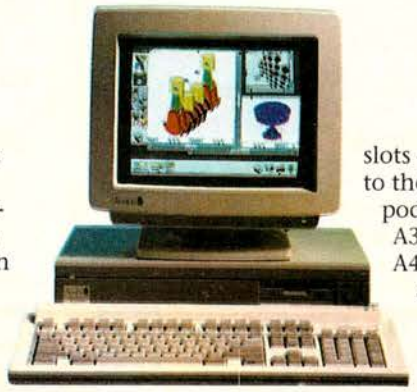

➤

of PC compatibility. In common with all current Acorn machines, the A4000 is capable of reading PC disk formats up to 1.44Mb and supports dedicated PC hard disk partitions.

Unfortunately, PC Soft – which allows the machine to emulate an IBM PC compatible in software – is sluggish under the ARM250 processor and not ideally suited to regular heavy use. However, a hardware PC card can be fitted for anyone who requires a great deal of DOS functionality.

These are quite reasonably priced at roughly £475 (inc VAT) for a 4Mb 386 and £650 (inc VAT) for a 4Mb 486 version. Alternatively, it may be worth considering the much faster ARM3-based A5000.

- A special edition model – the A4000S – developed with a Special Needs orientation was also featured in the October edition of *Acorn Computing*.

A5000: The professional solution

The current flagship of the Archimedes range, everything about the A5000 gives an air of power: Although identical in use to the other RISC OS micros, everything happens so much quicker.

The recently re-released machine uses a new version of the ARM3 processor which delivers 30 per cent more power than the former A5000 – an incredible 16.5 MIPS (millions of instructions per second). That is almost three times the processing speed of the ARM250 used in the A3010/A3020 and A4000 and four times that of the ARM2.

Solid-window dragging is smooth – even in the highest resolution screen modes – the !65Host BBC Micro emulator runs faster than the original micro did itself and PC Soft operates at a speed which is much more acceptable.

The styling of the main system unit is very similar to that of the A4000, however, it is taller, opening up much more space for internal expansion.

Due to both its speed and vast expansion capabilities, this is the most professionally applicable model in the Acorn range. There are four full size podule slots – compared to the single mini-podule of the A3010, A3020 and A4000 – which allows the easy installation of PC cards, sound samplers, video digitisers and Midi expansions to name but a few.

It lacks a standard SCSI interface, but one can be easily obtained and fitted. Provision is made for a second 3.5in floppy disk drive, but the space can be used, perhaps more practically, to house a second hard disk unit.

The A5000 is comparable to fast 486DX PC compatibles and the Apple Macintosh IIs. It is a serious contender as a professional machine, is priced competitively at £1,499 (inc VAT) upwards and has the support of a wide range of quality hardware and multi-tasking software.

- Two special workstation models are available – the ES for Econet and NS for Ethernet.

A4: Traveller's companion

Currently the only portable Acorn machine – other than the Pocket Book, based on the Psion Series 3 – the A4 is best described as a portable A5000. It still uses the original 25Mhz ARM3 processor, perhaps due to power consumption levels, and can sustain up to three and a half hours continuous use without the need for a battery recharge.

The integral grey-scale LCD screen is capable of displaying resolutions of up to 600x480 – quite remarkable considering its compact size – and has adjustable brightness. The A4 can be connected to an external monitor for displays of the same quality as all the other current Acorn models.

A problem portable micro developers in general face is how to interface users with the usually mouse-driven desktop environments. Acorn chose not to implement a trackerball in the A4 and instead supply a standard Archimedes mouse. If this proves impractical, you can choose a mouse emulation mode which operates through special keyboard sequences.

Table II: Standard configurations

Micro	ram (Mb)	Hard drive (Mb)	Colour Monitor	Multisync Monitor	Super VGA Multiscan Monitor	Software bundle	RRP inc VAT
A3010	1	-	+ £249	+ £299	+£374	Action Pack	£399
A3010	2	-	Standard	+ £50	+£125	The Learning Curve	£749
A3020	2	-	Standard	+ £50	+£125	-	£799
A3020	2	60	Standard	+ £50	+£125	-	£969
A4000	2	80	Standard	+ £50	+£125	-	£999
A4000	2	80	Standard	+ £50	+£125	The Learning Curve	£1049
A4000	2	80	Standard	+ £50	+£125	Home Office	£1099
A5000	2	80	-	Standard	+£75	-	£1499
A5000	2	80	-	Standard	+£75	The Learning Curve	£1549
A5000	2	80	-	Standard	+£75	Home Office	£1599
A5000	4	160	-	Standard	+£75	-	£1699
A5000	4	160	-	Standard	+£75	The Learning Curve	£1749
A5000	4	160	-	Standard	+£75	Home Office	£1799
A4	2	-	+ £249	+ £299	+£374	-	£1649
A4	4	60	+ £249	+ £299	+£374	PC Soft with DR DOS 6	£1999

Notes

- Add £249 to include a JP150 printer
- A hard drive can be fitted to any model; some may accommodate two

Investigator III £49.95

The new version of the highly successful Investigator II is a considerably expanded and improved package.
- Now includes not only the most powerful disc backup routines available but also a collection of other useful programmes:-
- A disc recovery package that will fix broken directories, undelete accidentally deleted files and lets you directly edit the disc contents - works with hard drives, floppy drives or other legal filing systems.
- A hard drive backup program that will backup from the hard drive - or other filecore system - to either floppy, syquest, tape streamer or other destination. The package is fully configurable and can backup just the changed files, by date or everything.
- A virus killer and detector that will detect and kill all current viruses. Warns you if an unauthorised attempt is made to access files such as !Boot files and will remove any existing infections for you. Configurable to be active at all times or only scan new discs.

This combination of packages makes Investigator III the best disc utility suite available on the Acorn and makes sure that you won't get caught out by damaged data!

Desktop Tracker £49.95

"...programming at its best" - Acorn User January 1993

Continuing in the tradition of the immensely popular Tracker package, use Desktop Tracker to create fantastic tunes with no extra hardware.

Desktop Tracker has been completely rewritten to incorporate many new and innovative features:
- Up to 16 tracks
- Fast playroutines
- 4 effects per note on each track, allowing up to 64 simultaneously
- Real time effects include pitch bend, arpeggio, volume slide, phasor effects, note retriggering and many more.
- Powerful editing facilities, including transpose, cut and paste, echo and more.
- Score display allows you to see your tunes and samples in traditional stave notation format.
- Public Domain playroutines and jukebox to allow tunes to be played on any machine.

MIDI/Sampler Interface £79.95

A high quality sound sampler and Acorn compatible MIDI interface.
- Fits into the normally unused Econet socket - it does not waste an expansion slot.
- Max. sample rate 50Khz.
- Perfect for educational use - can sample from a wide variety of inputs - CD, HiFi, Radio, Microphone etc.
- All cables and software supplied.
- User friendly Pulse sampling software provided.

Printer Port Sampler £39.95

Compatible with all Acorn machines - plugs into the Parallel Printer Port.

"Pulse" software provided includes the following editing features - fade in/fade out, over and under sampling, zoom in/zoom out, save and edit marked section, play forward or backwards at normal or high speed.
Save in various file formats - Armadeus, Tracker, Sound Module.

QD Bug £69.00

"....a must for assembler programmers, and comes very highly recommended" Archimedes World May '93. (overall rating 95%).

QD Bug is the definitive debugger for all ARM coders both beginner and expert. It has many powerful features including: single stepping, skip and force instructions, SWI history lists and trapping, customised flexible windowing system, view BASIC sources and text files from within the program, keypress emulation with macro record and playback.

Please contact us for further details on QD Bug.

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We are one of the largest suppliers of Acorn extra drives and supply a range of drives - the sizes below are just a selection. If you require other sizes (either larger capacity or 2.5" drives suitable for the A3020) please contact us.

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These drives can either be installed alongside your existing drive or as a replacement for it. All drives are supplied with the necessary cables and fitting instructions. Drives supplied are high quality Conner or Quantum drives.

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All systems are CDFS and Acorn compatible. Cards are available in full size 16-bit format for the A5000/540/400/300 series or the smaller size for the A3000/3010/3020/4000 series. All the cards are very fast - top transfer speeds in excess of 2.8Mb per second - contact us for exact details of performance and specification if required.

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Fancy a round of golf, Rick?

Though Rick Sutcliffe hasn't brought any clubs, he does have Virtual Golf...

THERE's no better way of testing out a golf simulation than stepping out onto the electronic green. So to suss out Fourth Dimension's 32-bit Virtual Golf we challenged the software house to give us a blow by blow account of how they fared – as well as some hints and tips for the armchair golfer.

The game was set up for a two-player handicap attempt round, with suitably autumnal conditions The team had a quick go on the driving range, a few *pitch and putts* in practice mode, then went into their round:

Hole 1

Pete: Call.

Rick: Tails...

Pete: Off you go then.

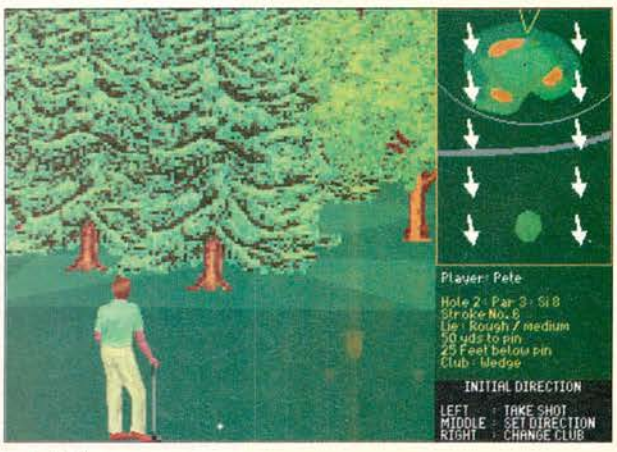
The 1st hole is a 470 yards Par 4 – meaning it would take an average of four shots to complete. There's a strong right to left wind as they look up the hill on the 1st fairway.

Rick: Might try a bit of slice into the wind here.

Pete: You're joking, right?...

Rick: Bang up the centre, that'll do nicely.

● *A tricky 150 yard Par 3*



Pete: Ok, watch this...

Pete, it ought to be pointed out, can't play golf for toffee. His first shot ended up somewhere near the adjacent 18th green almost out of bounds, so he had to hack his way back and made the first green in six, then four putted – quite a start.

Rick: You've hit your form then Pete.

Pete: Very funny. Get on with it.

Rick sinks his three putt for two over par – double bogey.

Rick: At least I stayed on the fairway.

Hole 2

Rick to tee off. A tricky 150 yard, Par 3 hole. No fairway, just the tee, the green, an awful lot of rough, oh yes, and three bunkers. Just how Pete ended up visiting all three is still a mystery!

Rick: The auto-caddy says a 7 iron, the back-wind is only slight so I would agree.

Pete: Oh, very technical.

Rick: Watch & learn Pete... (thwack)... Beautiful – clean as a whistle, a few feet from the pin.

Pete: Which club was it you used?

Rick: Not telling.

Pete: Fair enough. 3 wood I think... (thwack)...

Pete: Where's the green gone? Talk about can't see the wood for the trees. Okay so the club selection was a little out – I'll listen to the caddy in future won't I?

So Pete holed out in 10 shots again and Rick managed a *birdie* 2 – 1 under Par.

Hole 3

This time 450 yards and Par 4. Fairly straightforward but a few tricky

● *Water lies left and right and in front of the green*

bunkers. Quite a strong back-wind should help with the length of shot.

Rick: Two holes, 10 shots at each. You're consistent if nothing else.

Pete: Shut up and play your tee shot.

Rick's ball landed just on the left of the fairway. Pete dropped into the bunker on the right.

Pete: I don't believe it! Did you see the amount of slice on that ball?

Rick: You can't blame the mouse; I'm swinging it fine. Try using a ruler or book edge to run the bottom of the mouse along...

Pete: I was only joking.

Pete hacked his way over the hill and on to the green in four strokes, Rick made it in two.

Rick: Put the ruler away, Pete. I wasn't being serious – and, let's face it, you need more help than that ruler, you need a miracle.

Pete: Do you want to wake up with a crowd round you?

Rick: Touchy, touchy.

Pete: Anyway, does that lighter green bit, near the hole, mean that it slopes more than the rest of the green.

Rick: It looks like it. Look from the side and you'll see...

Pete: Oh yes, very clever.

After a few missed putts by each player, they eventually holed out; Rick for six and Pete for eight.

Hole 4

Rick: Only 4 over Par that time, you're improving.

Pete: You were 2 over.

Rick: Touchè.

Pete: Pardon me?

Rick: Never mind. Look are we playing this game or not?

Pete: It's you to go.

Hole 4 is a 500 yard Par 5 dogleg to the left. The hazards are a couple of bunkers and a rather large water trap – lake. These are aided by the strong right to left back-wind.

Rick: That'll do, a nice long drive up towards the left turn.

Pete: Sounds good to me... (thwack)... Get out... Get out... Phew. I thought that was in the water, for sure. I should be able to clear those trees and get nicely on to the green – don't you think?

Rick: Not a chance.

Pete: We'll see about that. Here goes, a driver (1 wood), not too hard ...

Pete enters the water.

Pete: Shut up laughing.

Rick: Sorry, but your face is a picture. You're scoring as well as you do in the real game, that's for certain.

Pete: I like the bit about getting my feet wet – very funny.

Rick: Right, if I take a 5 wood – thank you caddy – and really hook it round those trees. I wonder if? We'll soon see.

The ball hooks around the trees and lands in the top bunker, near the green. After a little pitching and putting on the very tricky green, Rick is down in (Par) 5 and Pete in 8.

Hole 5

A challenge of 190 yards, Par 3. The hole is placed virtually on the lip of a three foot drop, so your initial drive is all important.

Rick: A bit of head-wind. A 4 iron I think... (thwack)... There we are, nice and straight.

Pete: (singing) Anything you can do... (thwack)... Oh.. Bunker!

Rick sinks a dream putt of 20 yards for Par, and Pete manages a bogey 4.

Hole 6

Pete: Good hole that one. I'm really getting the hang of this.

Rick: Hmm are you really? I'm not convinced myself. We'll see about that.

This Par 4, 340 yard hole is a left handed crescent around a woodland. The strong head-wind won't help matters and the eight bunkers are beckoning. Rick takes a driver and tries a slice around the trees – the ball lands plum in the middle of the fairway. Pete tries the same manoeuvre, but the ball hooks, instead of slicing, into the rough.

Pete: Ok, I can still make it to the green. What you don't realise is that I've been, quite deliberately, leading you into a false sense of security.

Rick: Really?

Pete then sinks a 48 foot putt to hole out in Par. Rick holes out for bogey (1 over Par).

Hole 7

Pete to tee off (having won the last hole) 400 yards, Par 4. A fairly easy drive, pitch and putt. The large water traps are the only real hazard.

Rick: You don't want to drive too far off this tee, you know.

Pete: Look here, when you can sink 48 foot putts – then you can give me advice.

Thwack... splosh...

Rick: Told you didn't I?

Rick takes two 5 wood shots and lands within feet of the pin. Pete takes five shots and lands on the top shelf of the green with a daunting 34 foot downhill putt, with a 4 foot drop just before the hole. Somehow Pete manages to sink the putt.

Pete: GET IN. What can I say – somebody book me in for the Scottish Open.

Rick: How many times can a person get lucky in one game?

Rick holes out to Par. Pete at 2 over.

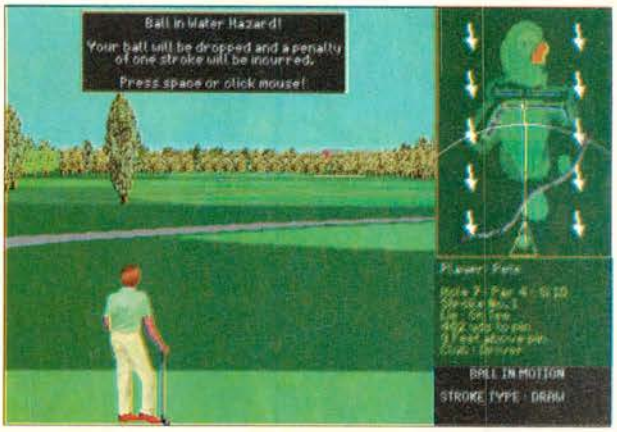
Hole 8

A 400 yards hole set at Par 4 with water left and right of the fairway and a big lake at the front of the green. Rick plays a gentle drive and the wind drifts the ball to the left side of the fairway. Pete hits a superb drive (by his standards) and lies in prime position for a pitch on to the green.

Pete: Please let's start again.

Rick: Look I'm telling you you're a flash in the pan. Just wait til the really tricky holes start to come up.

Pete hooks with a wedge, far too soft, and lands on the far bank of the lake. The ball rolls, gently and agonisingly, back into the water. After which Pete lands in the single bunker to the right of the green. Rick plays straightforward, cautious shots and holes out for birdie (1 under Par). Pete ends up 4 over.


Ball in Water Hazard!
Your ball will be dropped and a penalty of one stroke will be incurred.
Press space or click mouse!
BALL IN MOTION
STROKE TYPE : DRAW

● *Don't under estimate the water hazards*

Hole 9

Two really nice, long drives are needed to reach the pin on this 440 yard Par 4. Bunkers left and right of the fairway are the only hazard.

Rick hits a driver clean between the bunkers. However Pete's ball is taken by the strong wind into the left hand trap. From where he plays two shots, only to find the next bunker on the left.

Rick: Brought your bucket and spade, Pete?

Pete: I'm gutted.

Rick: You're just a poor loser, I'm loving this.

Pete: LOSER? Who's a loser? There are nine holes left and I'm not giving in without a fight.

Rick: Can we get on with it then?

Pete: You asked for it.

Pete holes out 3 over Par, Rick for bogey.

Pete: Right I'm going to start concentrating properly now.

Rick: Oh yes? This should be fun.

Player A: Rick.....Handicap 28
Player B: Pete.....Handicap 28

Monday 30th August 1993
Wentworth

Hole No.	Yds.	Par	Str I/x	Scores A	Scores B	Scores *	Scores *	Win
1	474	4	7	6	10			
2	156	3	8	2	10			
3	452	4	10	6	8			
4	504	5	14	5	8			
5	194	3	11	3	4			
6	346	4	13	5	4			
7	402	4	10	4	5			
8	400	4	9	3	8			
9	442	4	10	5	7			
Out	3370	35		39	64			

Par to hole 10 : 38
Players Scorecard : Handicap Assessment
VIRTUAL GOLF ©1993 The Fourth Dimension

Hole No.	Yds.	Par	Str I/x	Scores A	Scores B	Scores *	Scores *	Win
10	188	3	12	0	0			
11	378	4	10	-	-			
12	484	5	12	-	-			
13	442	4	14	-	-			
14	188	3	9	-	-			
15	478	4	12	-	-			
16	382	4	14	-	-			
17	573	5	15	-	-			
18	505	5	14	-	-			
Home	3618	37		-	-			
+Out	3370	35		39	64			
Total	6988	72		39	64			
H'cap				28	28			
Nett				11	36			

Test your own skills

THE Fourth Dimension are offering a choice of their range of games to the first six readers to be pulled out of the sack after 31 December 1993.

All you have to do is to guess, calculate or psychically deduce what Rick and Pete's final scores were in the game. So far Rick is on 39 strokes and Pete is on 64 strokes. Our judges have already made their decision which will remain in its sealed envelope until the closing date.

Name .....

Address .....

.....

Post Code .....**Tel**.....

I think that the final scores in this game of Virtual Golf were:

Rick ☐

Pete ☐

I would like the following game as my prize if I am one of the lucky winners: .....

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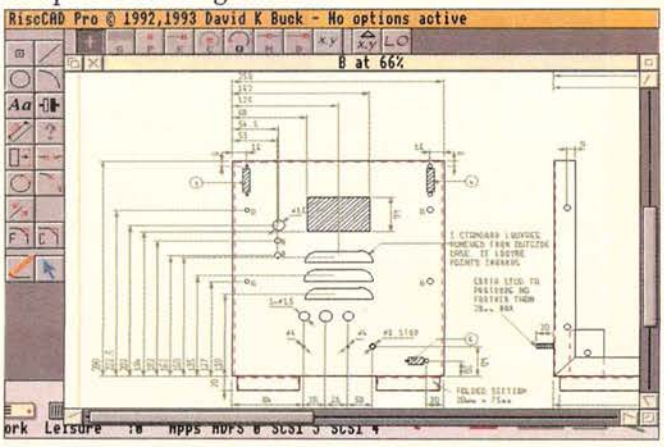

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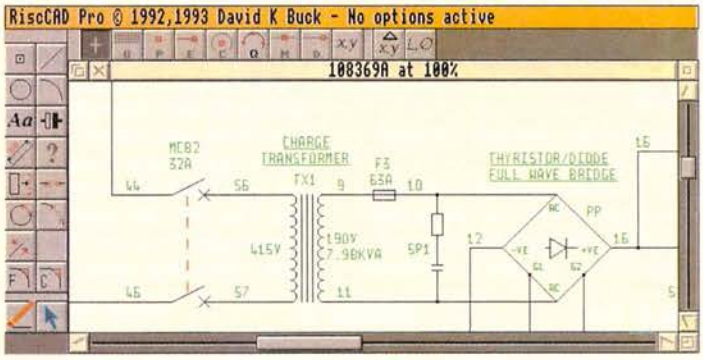
RiscCAD Pro © 1992,1993 David K Buck - No options active
108369A at 100%
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RiscCAD Professional costs £199.00 inc VAT (£169.36 exVAT)

Please note our correct phone number is 0924 254800 Apologies to all those who bought a Demo and couldn't get through!

All the trimmings

Steve and Anne Bruntlett show how to add flair with a touch of computerised decor

WE'LL be working in this seasonal project towards creating your own boxes for gifts. The aim is to explain the principles which can be used to produce more elaborate products after gaining experience and confidence. To help you along there are some box outlines and Christmas clip art on the MegaDisk.

Inspiration for the boxes could come from books to be found in the handicrafts section of major book stores which present reproduction gift boxes from different periods.

These are printed in colour in a sort of loose leaf book on card sheets which can be cut out and assembled and used to contain small gifts.

The other source is commercial products. Around Christmas the sweet and small gifts manufacturers seem to excel themselves in producing exciting and intricate packaging, so look out for unusual ones in sweet and gift shops.

These will give you a range of small containers to use for presents or for hanging as decorations on the Christmas tree. It would be nice to produce something spherical resembling baubles, but cubes are probably easier to make.

A scanner could come in handy here, and if you are averse to drawing or painting your own designs a host of clip art is available, such as the excellent Desktop Folio Christmas Theme Pack from ESM.

Although intended as a resource for use with Desktop Folio, it has some super ideas and designs to work with in the production of cards (pop-up and normal), advent calendars, invitations and posters.

There's also a Christmas Clip Art pack from Sherston Software, a My World Christmas pack from ARMTech, an Xmas disk set from Desktop Projects, a Church Year disks set from DEC_data which has Christmas bits in it as well as various PD clip art disks.

Also available are a Christian clip art set in PC format, which can be converted using !ChangeFSI, from CPO which has some excellent scanned Christmas illustrations, and you'll find Christian Clip Art books in Christian book shops with illustrations which can be scanned and used in a variety of ways.

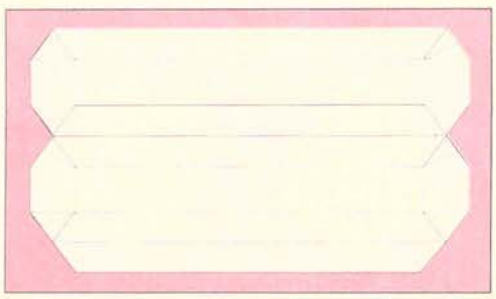
Other books worth looking out for in the Dover series are Ed Sibbett Jr's Christmas Designs and Christmas Borders. These are copyright free, so there's no problem in using them in your own work. Just look in the adverts in Acorn Computing and around a few bookshops to see what's available.

Boxing clever

A simple cube can be produced in Draw, switching on the gridlock to make alignment easier. Start by drawing four squares down the paper, leaving approximately 10mm for a flap at the bottom.

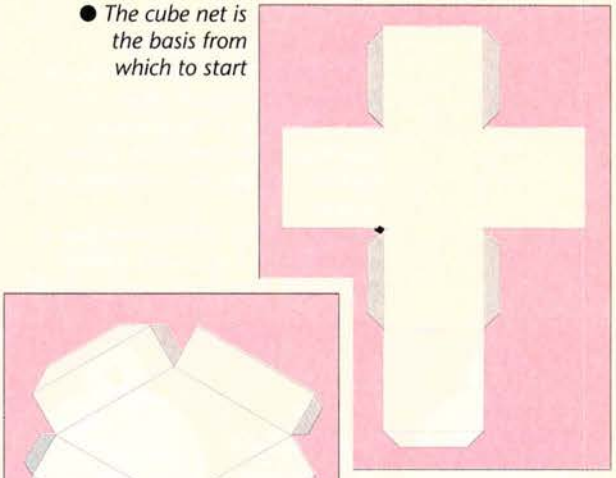
Add squares on either side of the second box down, and bevelled flaps either to the top and bottom of these or to the sides of the first and third squares, to enable the

➤

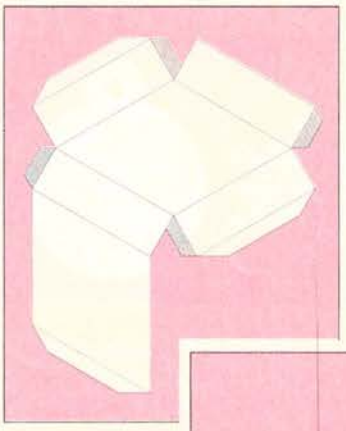


● *Use commercial art – such as this Austrian sweet box with push-in ends – for inspiration*

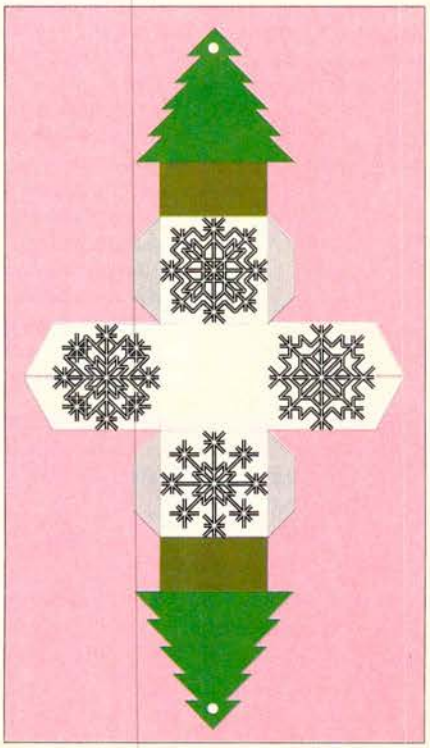
● *The cube net is the basis from which to start*



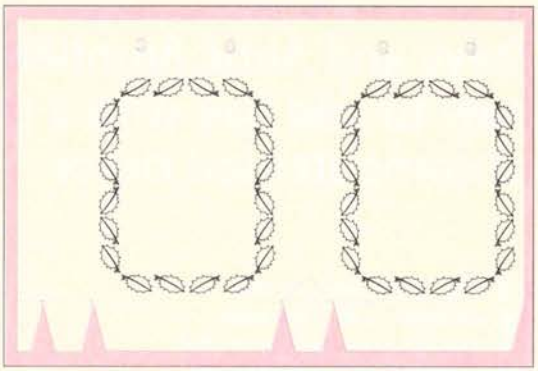
● *An outline diamond shape box is more unusual ...*



● *... as is a Christmas tree box with snowflakes*



● *Create a bag with an applied sprite based on a stained glass window...*



● *...or opt for a bag with a drawn holly leaf border*

➤

cube to be glued together.

There were no side flaps on our Christmas card box. Only the top was stuck to the bottom. The side flaps were left loose to be tucked in when the envelope was opened.

Once you've drawn one flap it can be copied and used where necessary. The same applies to the squares, which can be copied from one original – you just need to work out how large to make the first square.

● *For the more ambitions... imitation baubles with snowflakes*

If you have around 30cm printable space down your piece of A4 paper in Draw, DrawPlus or Vector then four squares of 70x70mm leaves you enough space for a 10mm flap.

Drawing a diamond-shaped box makes for a bit of variation, and, although it may seem complicated, the use of an isometric grid with a coarse gridlock such as 5mm makes the whole process a lot easier.

To see how easy the process is, look at the diamond box outline on the MegaDisk. The box with Christmas trees on the top is a bit more complicated, but most box design is a matter of working out an initial layout, ensuring the sides of the boxes to be joined are the same length, and working out where you need flaps for either constructing the box or for closing the lid.

Once you've printed out and assembled it you can see where improvements need to be made, and because your original drawn design is fully editable it may only be a simple matter of moving some of the control points or positioning an odd flap or two.

Similar principles apply to the production of the little gift bag which has been designed to fit on the standard screen of a painting program – full screen size. The idea is that it can be dropped into any paint program which converts drawfiles, but there's a sprite version just in case your paint program can't handle drawfiles.

Say it with boxes

The sprite version can be painted or have clip art added before printing and assembling. The drawfile version can have drawn detail added and remember that you can also drop sprites into drawings produced in Draw. For example, my painted stained glass window design has been dropped on to the outline drawing of the gift bag and rescaled to fit the front and back panels exactly.

The resulting drawing or painting needs cutting out, scoring and folding. The top border goes inside the bag for reinforcement and also gives guidance for punching holes ready for string or ribbon to make the handle. Parts of the original image can be used as a border for the gusset panels, giving the whole bag an integrated feel.

The versions on the cover disk include the basic drawfile, one with a holly leaf border and another with stained glass panels.

Just imagine

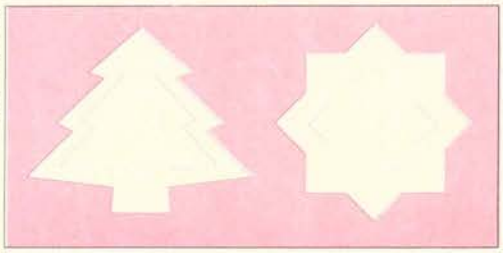
Painting images for Christmas decorations, boxes and cards depends on your artistic skills but if you're unsure about what to produce start by using geometric tools to produce shapes such as Christmas trees, snowflakes and stars.

Geometric shapes can be drawn more easily using the gridlock and a continuous line in Draw, DrawPlus or Vector. Snowflakes are relatively easy to turn out.

The first examples illustrated are based on a square drawing grid, but you can change the grid to isometric and produce snowflakes based in the more usual hexagonal format. The resulting images can be used for producing patterns.

Another possibility uses a line

● *Use different coloured card to produce Christmas trees and stars*



Christmas clip art suppliers

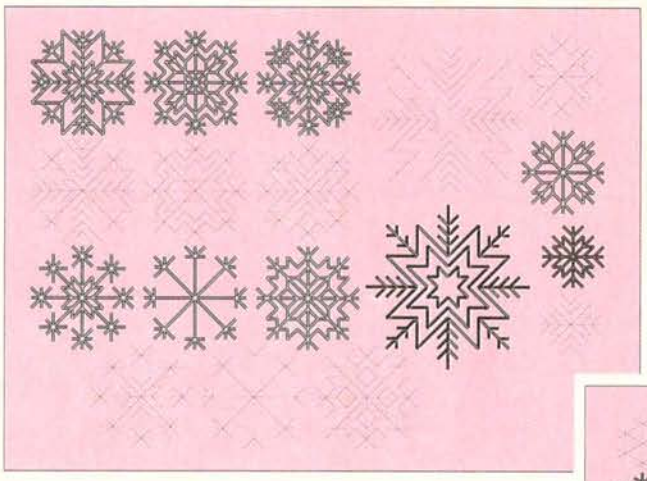
ESM, Abbeygate House, East Road, Cambridge CB1 1DB. Tel: 0223 65445

Sherston Software, Swan Barton, Sherston, Malmesbury, Wiltshire SN16 0LH. Tel: 0666 840433

ARMTech (UK), 86 Meadowbank, Moor Lane, Holway, Holywell, Clwyd CH8 7EF. Tel: 0352 715840

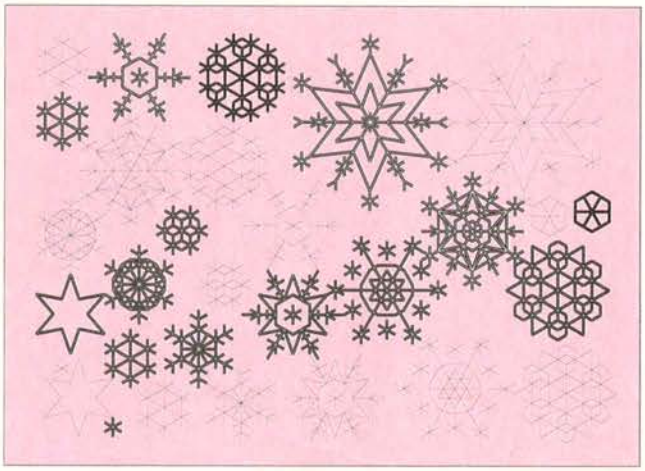
DEC_Data, 60 Danes Road, Exeter EX4 4YA, Tel: 0392 221702

Christian Publicity Organisation, Garcia Estate, Canterbury Road, Worthing, West Sussex. BN13 1BW. Tel: 0903 264556



● *Snowflakes based on squares using a rectangular grid – but end up with eight sides*

● *These flakes are based on hexagons using an isometric grid*



thickness of four, copying the shape, changing it to line thickness one, dropping the copy exactly over the original and changing the colour to white, producing an outline snowflake which can then be coloured.

The monochrome/colour problem needs to be sorted out depending on your printing facilities. If you don't have access to a colour printer you might want to do most of the work in outline so that it can be hand coloured after printing out or alternatively printed out on coloured paper.

Once you've produced a few snowflakes they can be printed out, stuck on card, coloured and cut into bauble shapes and strung up as decorations round the house or on the Christmas tree.

If you want to print them on both sides a spot of lateral thinking is called for. Print the first side as usual – see if your printer will take thin card, as even laser printers can handle two-sheet card – reverse the whole drawing using left-right flip options, turn the paper over laterally and reprint.

The resulting printout will hopefully have matched snowflakes on either side of the paper in accurate registration ready for cutting out. If not, check your printer driver paper margins. You could churn these out by the hundred if you're trying to keep children occupied!

Shapes can be filled in with solid colour to produce simple decorations to be hung on the Christmas tree or round the room. Alternatively tree and star shape outlines can be printed in pairs on to coloured card, cut out, scored, stapled together and folded to make something that looks a bit more three dimensional.

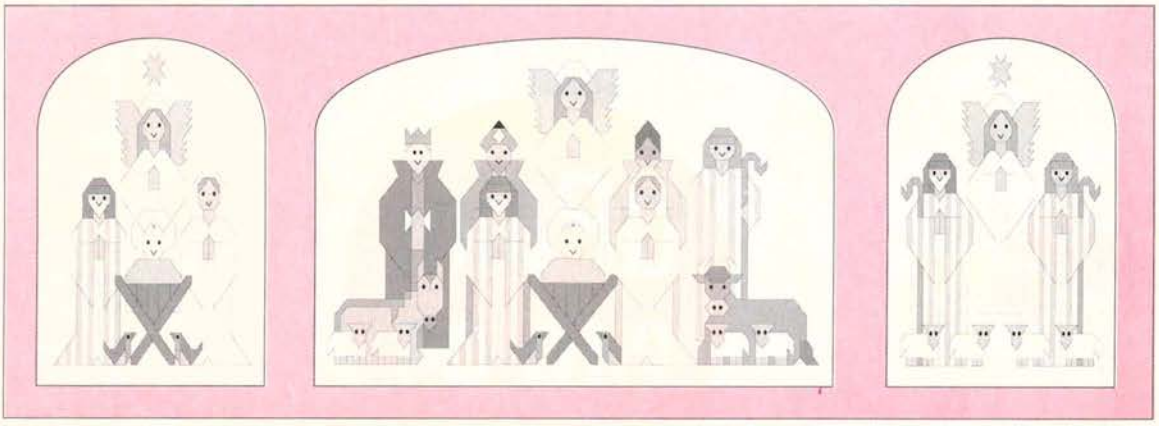
You could experiment with gold card, and while you might not be able to print on it unless it was very thin, you could at least use your designs as templates to produce accurate decorations.

When using a drawing package you can treat a Christmas tree, holly leaf, star and a stocking with different line thicknesses and fill colours and repeat them in different patterns to produce endless variations. This is how the holly leaf border was produced. Keeping gridlock set makes horizontal or vertical placement child's play.

We've had a great time putting all these ideas together, especially in discovering how to produce 3D-looking snowflakes for example. We hope you find something useful in the above ideas.

The main thing is to try things out, experiment a bit and produce something you like rather than being dictated to by the purveyors of clip art. Have a happy Christmas and try to remember what it's really all about.

● *At the very least create a simple gatefold Christmas card*



Gis Christmas

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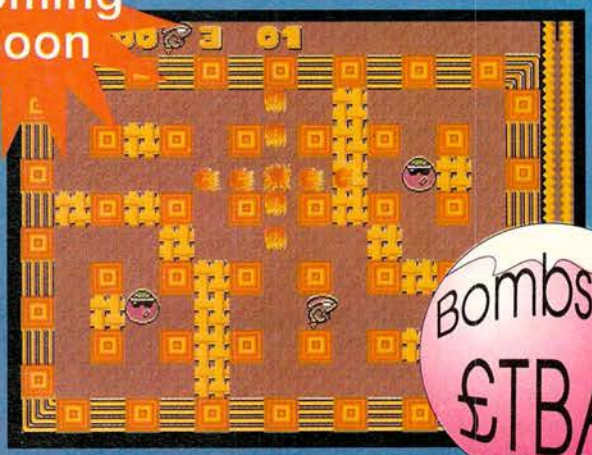

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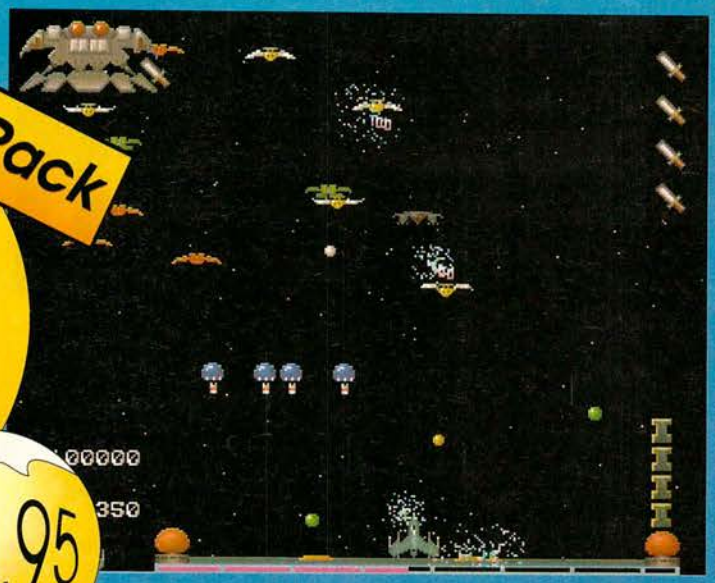

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Merry Christmas & a Happy New Year

Naked

THROUGHOUT history some of the greatest inventions and development projects have taken place in rather humble surroundings. And, as the rest of the world knows, Britain is not the best place to live if you are an aspiring inventor or scientist.

Yet despite the drawbacks encountered here, like lack of interest from successive Governments, work continues, usually by individuals working with leading-edge technology. And it's in this spirit that a former film editor and young hardware and software developer have produced what appears to be the best thing since sliced bread for the production of video tape programmes.

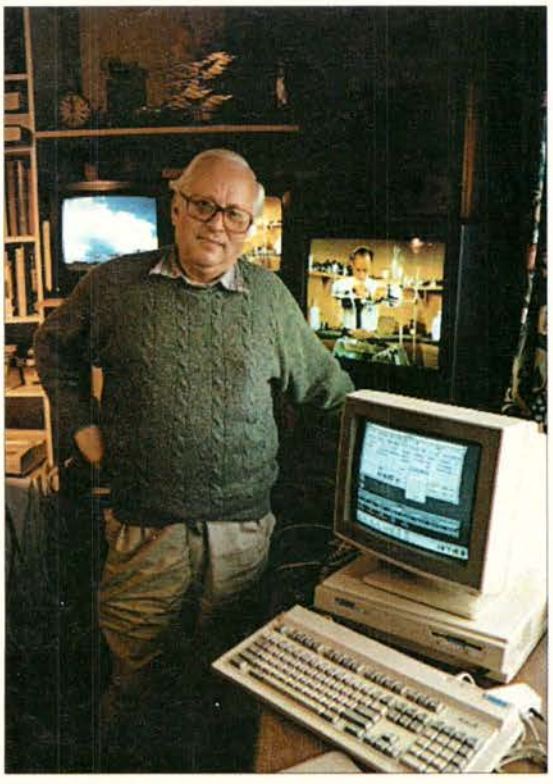
Ever since the invention of cinematography – movies to the likes of you and me – the race was on to find an easy, fast and accurate way to edit the film.

As any film buff will tell you, good editing can make all the difference to the finished product, turning an otherwise boring series of shots into an impressive award-winning production – or completely ruining otherwise excellent camera work.

With the advent of video the old problems of how to edit material returned. However, in its crudest form, instead of taking a pair of scissors and physically cutting a piece of film out of a reel and sticking the two pieces back together again, video tape required a totally different approach.

Video editing consoles, offering the ability to mix, fade, enhance, flip and add bells and whistles to just about any production, proliferated. Yet despite these new technological marvels making life so much easier, there were people behind the scenes busily working on new, and faster, ways of achieving the ultimate editing machine.

The thought was, using computers to control the majority of the switching processes involved with the video recorders, in addition to creating and adding stunning graphics and titles, the process of editing could achieve greater quality and shorter editing times than ever before.



● *Alan Afriat with his 12Mb A540 running the Octopus system*

Alan Afriat Associates, 24 Combemartin Road London SW18 5PR. Tel 081-789 2663

So far there have been a number of Edit controllers for such machines as PCs and Apple Macs, all of which have their own particular plus points, but for some reason the incredibly fast and efficient Archimedes has, until now, been overlooked. Enter a new company, Aladin (just one *d*), and their incredibly user-friendly Octopus Edit Controller.

The dream of Alan Afriat, Aladin's founder, was "to achieve on tape the flexibility and creativity of film editing at a cost which is affordable in a climate of tumbling programme budgets".

For almost a year Adam Goodfellow, Aladin's designer, worked on the edit controller and associated software. Progress was rapid and has reached the point where Alan is predicting a market launch for the Edit Controller and software package early in 1994.

Alan Afriat worked in the film and television industry for a good number of years before leaving Thames Television in 1989. He gained a BAFTA award for his work as supervising editor on the *World At War* series.

With the industry changing so rapidly from film to video Alan realised that there was a need for a video editing system flexible enough for the demanding professional, yet easy for the non-technical to understand.

With his particular insight into the problems involved in the

video

Kevin Roberts discovers how Acorn machines are breaking into the world of professional programme-making

production of a television programme, he set about making a list of options that a desirable edit suite should have to make it attractive to the broadcaster who needed the proverbial bells and whistles, but with sufficient front-end software support to make using it as simple as possible.

Having discovered the Acorn machines while working on an education programme, he realised that its multi-tasking capabilities combined with his specification and the skilled programming of Adam would produce an impressive yet easy-to-use system.

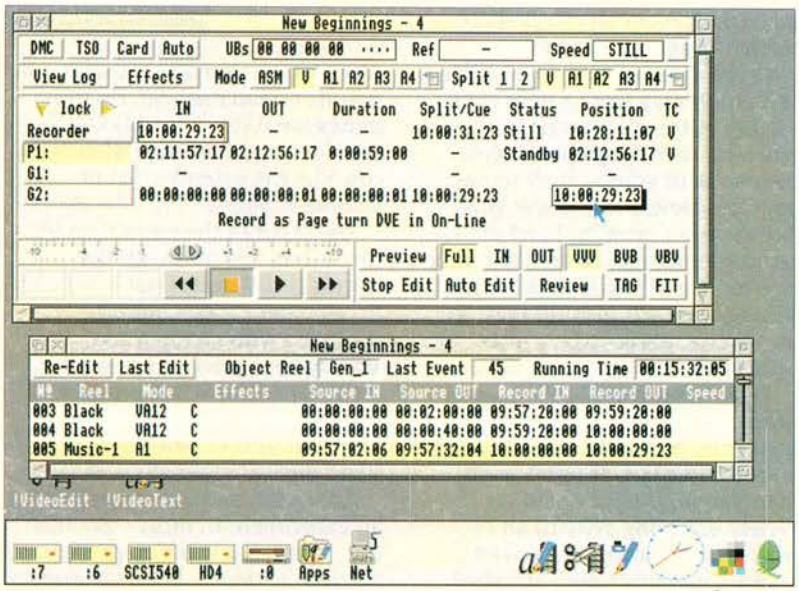
Octopus offers independent control of up to eight editing machines. The unit comes on a proprietary single width card and break-out box, compatible with all Acorn machines which accept standard podules.

It is fully RISC OS 3.1 compliant, running under the desktop with active on-line help if required. By merely moving the pointer to any part of the screen the help window explains to the novice what the feature is and how to use it. "Obviously", says Alan, "The help feature can be switched off once the user becomes familiar with the way the software works".

Octopus will control any editing machines which conform to Sony RS422 protocols including disk recorders, DAT and the new HIDAT and ADAT machines.

It also provides on-screen control for Fast forward, jog/shuttle, rewind, stop, play, mark in/out, preview (full, in or out, VVV, VBV or BVB), auto-edit, stop edit, review, tag, fit/fill from window software panel for video, plus 4 audio tracks with up to 2 split edits.

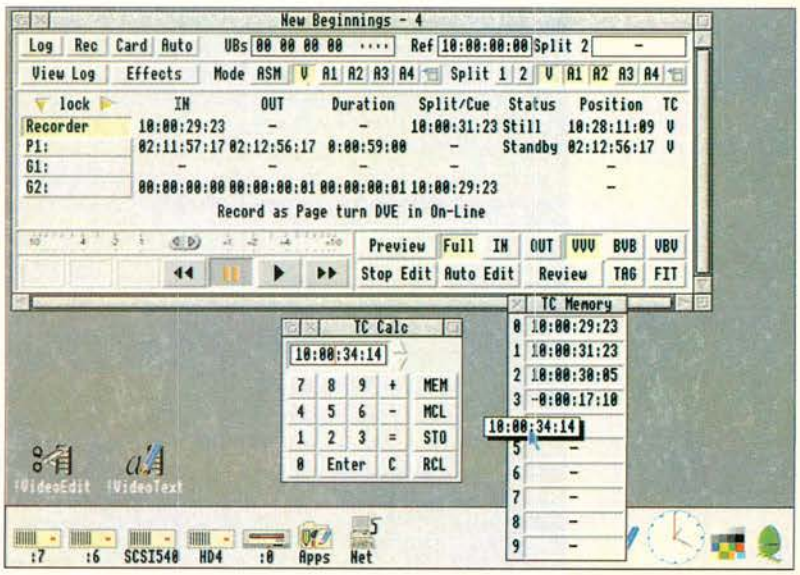
Other features include, VTR variable speed control, 4 GPI outputs allowing triggering of CD players, DVEs, and tape machines, button selectable insert or assemble mode, button selectable timecode display for VITC, LTC, CTRL or AUTO.


New Beginnings - 4
DMC TSO Card Auto UBs 00 00 00 00 Ref - Speed STILL
View Log Effects Mode ASM V A1 A2 A3 A4 Split 1 2 V A1 A2 A3 A4
lock IN OUT Duration Split/Cue Status Position TC
Recorder 10:00:29:23 - - 10:00:31:23 Still 10:28:11:07 V
P1: 02:11:57:17 02:12:56:17 0:00:59:00 - Standby 02:12:56:17 V
G1: - - - - -
G2: 00:00:00:00 00:00:00:01 00:00:00:01 10:00:29:23 10:00:29:23
Record as Page turn DVE in On-Line
Preview Full IN OUT VVV BVB VBV
Stop Edit Auto Edit Review TAG FIT
New Beginnings - 4
Re-Edit Last Edit Object Reel Gen_1 Last Event 45 Running Time 00:15:32:05
003 Black VA12 C 00:00:00:00 00:02:00:00 09:57:20:00 09:59:20:00
004 Black VA12 C 00:00:00:00 00:00:40:00 09:59:20:00 10:00:00:00
005 Music-1 A1 C 09:57:02:06 09:57:32:04 10:00:00:00 10:00:29:23
!VideoEdit !VideoText
:7 :6 SCSI540 HD4 :8 Apps Net

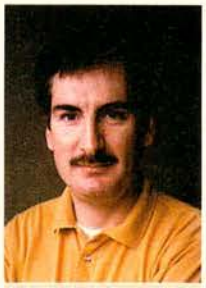
● *You can just drag timecodes from one place to another*

"What makes Octopus so special" says Alan, "Is the ability to drag time codes from a database to the control panel for fast access to any shot. If the tape with the shot on is not loaded in the players you are informed which tape is required".

Usually when compiling a list of ➤


New Beginnings - 4
Log Rec Card Auto UBs 00 00 00 00 Ref 10:00:00:00 Split 2 -
View Log Effects Mode ASM V A1 A2 A3 A4 Split 1 2 V A1 A2 A3 A4
lock IN OUT Duration Split/Cue Status Position TC
Recorder 10:00:29:23 - - 10:00:31:23 Still 10:28:11:09 V
P1: 02:11:57:17 02:12:56:17 0:00:59:00 - Standby 02:12:56:17 V
G1: - - - - -
G2: 00:00:00:00 00:00:00:01 00:00:00:01 10:00:29:23 -
Record as Page turn DVE in On-Line
Preview Full IN OUT VVV BVB VBV
Stop Edit Auto Edit Review TAG FIT
TC Calc
10:00:34:14
7 8 9 + MEM
4 5 6 - MCL
1 2 3 = STO
0 Enter C RCL
TC Memory
0 10:00:29:23
1 10:00:31:23
2 10:00:30:05
3 -0:00:17:10
10:00:34:14
!VideoEdit !VideoText
:7 :6 SCSI540 HD4 :8 Apps Net

● *A timecode calculator and scratch memory are all part of the package*



Kevin Roberts is a freelance Cameraman for BBC Television in Manchester working mainly on news and documentary programmes.

He has travelled to many parts of the world including Albania on three occasions. One documentary on Albania was recently short listed for the ONE World Television award.

Kevin's interest in computers goes back a good number of years when he managed to combine his interest with his work at BBC Radio Manchester, now GMR, by producing and presenting a weekly computer feature on Saturday mornings.

shots for the final edit the time code for every single cutting point has to be written down. With a total of eight individual numbers to be written down for each one literally thousands of figures may have to be written longhand. However, by just pointing the cursor and clicking on the mouse button the numbers can be quickly dragged from one part of the screen to another, placed in a database or the EDL (Editor's Decision List) is created automatically as you go.

To the domestic user such a list of features may seem a little over the top. After all, most non-professional videographers seem content with editing their footage between camera and home VCR. But there is a growing band of camcorder users who are venturing into more exciting realms of video editing and such features may, in due course, prove to be a little irresistible.

Video camera makers are doing their part to entice users a little up-market by providing cameras with built-in time but, as usual, some manufacturers have opted for a variety of timing systems all of which seem incompatible with another manufacturer's standard. Octopus, however, allows for a variety of standards, thus making it attractive to a wider market place.

The eventual market price is expected to be in the region of £2,000. That may seem a little on the high side but compared to the cost of some domestic machines it is quite reasonable and, for the professional market, £2,000 is a mere drop in the ocean when you consider the extensive list of features it offers.

● *Adam Goodfellow learnt the art of editing and created Octopus in under a year*

The proof of the pudding is in the eating, and although the system is still in its final development stages, footage compiled with Octopus has already been seen on Channel 4's 10 part *Your World* primary schools series transmitting on Mondays and Wednesdays at 11.18 am.

According to Alan "It has been an experiment in more ways than one. The series was a co-production between Channel 4, Encyclopaedia Britannica and CASE Television, and was designed as resource material for teachers.

"Most of the post production work, including the programme compilation, computer graphics and captioning were carried out by my company Alan Afriat Associates, who were also experimenting with a novel approach to graphics and non-linear editing using Acorn computers to drive just about everything".

What Aladin have produced is without doubt an impressive piece of kit that shows off the power of Acorn computers beautifully, and I am sure that once launched will quickly find devotees in the professional, and semi professional fields.

As for the wealthy amateur, it does have a lot to offer, though maybe just a little too much, but it is worth investigating if top quality editing is the ultimate goal.

As with all products still under development, features on offer may be changed or extended, and I would strongly recommend contacting the company to find out if what you are after is included in the software package.

What does it all mean?

Editing for TV or film involves putting sequences of films together in the best order to produce the required effect and the job is done by the Editor. It may also involve bringing in sound effects, music and so on. Whether on film or video every sequence is composed of frames and every frame is uniquely defined by an eight-digit *timecode*.

The usual process with video editing is to make a copy of the original source material on to a lower quality tape then use this in an *offline* editing suite where the editor puts it together and make a list of all the timecodes of the beginnings and ends of sequences and how they link together.

This list is the *Editor's decision list* (EDL) and is then taken to the very expensive *online* editing suite where the original material is put together as specified by the EDL.

In non-computer environments – and in some of the computerised ones – EDLs must be compiled by hand which can introduce errors that will be very costly in *online* time.

Computerised online suites can accept a specially formatted text file of timecodes and automatically compile the different shots and effects. But if the text file is created by hand you still have the problem of human error.

Using a computerised *offline editor* it is possible to use the system to keep track of all the cuts and fades and to compile the EDL automatically – this concept has not been lost on designers for other computer systems. Yet the EDL facility can be a very expensive optional extra and you *still* have to type the timecodes.

Alan Afriat Associates have developed Octopus to allow all timecodes to be dragged between areas, which is used with a database of all the sequences plus their start and end timecodes. This not only speeds things up – a quick mouse drag instead of time-consuming typing – it avoids potentially disastrous errors.

For the amateur and professional camcorder user – wedding videos and the like – Octopus would be used for direct mixing, rather than creating an EDL, and as such it provides a very cost-effective system.

The word processor for Acorn RISC computers

Impression Style is a new word processor combining the best points of all earlier word processors with many powerful features new to the Acorn platform. Impression Style is a word processor suited for all users - the occasional letter writer, student, small businessman or professional writer. It also incorporates many DTP features so that it can handle complex page layouts with ease.

Word Processing

Impression Style is a capable and very powerful product but it is also an extremely easy to use word processor. In order to make it simple to use, we have incorporated the very latest software technology, found on no other Acorn word processor, including two types of on-line help - interactive help and full hyper-text help. Not only can you tell at a glance what all the controls and menus do, there is comprehensive on-line documentation explaining the features. Simply double clicking on a topic or keyword will display an explanation - and of course you can do this on screen while using Impression Style.

IMPRESSION Style

It also offers drag and drop editing - the simplest, most intuitive way to edit documents. There is an integrated thesaurus and dictionary with definitions (another first for Acorn machines) both based on the highly respected Collins publications. Impression Style is the wordsmith's dream come true.

Modern word processing involves much more than creating and editing long text files - producing monospaced typewriter-like documents is often no longer acceptable. Therefore Impression Style offers page layout capabilities second only to the very best DTP packages and it does this without compromising the word processing abilities.

It allows graphics to be embedded into the text or placed anywhere on the page and includes another first for Acorn users - OLE or Object Linking and Embedding.

OLE EXPLAINED

If you want to edit the embedded object (this is usually a graphic, but it could be other data such as a table or equation) you simply double click on the data, which is then transferred directly to the appropriate editing application - for example !Draw. Once you've edited the graphic, simply closing the window will transfer the data directly back into Impression Style. This powerful technique couldn't be more convenient or easier to use.

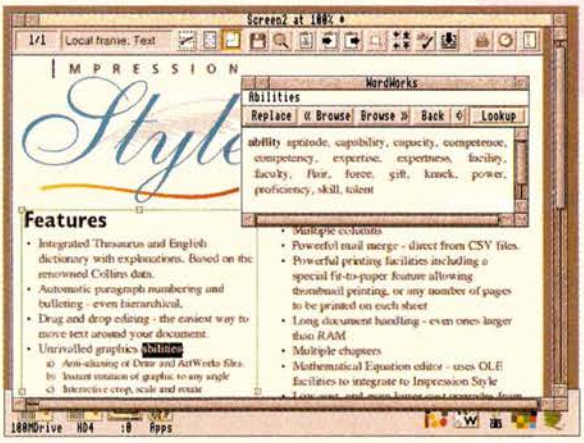


Illustration shows new button bar enabled at the top of the screen. This offers direct, instant access to commonly used functions such as saving, cut, copy, paste. One button is the new zoom tool which allows ArtWorks style drag-zoom into any region of the document.

It also shows a word selected in the text and the pop-up thesaurus window showing a list of synonyms. Note the smart selection of root word.

There isn't room to cover all aspects of Impression Style, but some other features include:

- Impression Junior, II, and Acorn Advance file compatibility.
- Integrated WordWorks thesaurus and dictionary.
- Automatic section and paragraph bulleting, numbering and re-numbering.
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A full specification is available on request.

HOW TO UPGRADE

Copies of Impression purchased from Computer Concepts after 1st September 1993 can be upgraded without charge.

All registered owners of Impression Junior and Impression II, can upgrade to the full version of Style, including dictionary/thesaurus, by quoting the registered serial number.
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Existing Impression II owners can upgrade to Impression Style for £29.00 + VAT but a further upgrade to Impression Publisher, when it is released, will cost another £29.00 + VAT (£34.07 incl.)

Owners of other WP and DTP packages can also upgrade to Impression Style. Return the key/master/N° 1 disc of your existing package with £70.00 +VAT (£82.25 incl.)

* This offer is open to owners of the following packages: Wordz, Ovation, First Word Plus, TechWriter, Easi-Writer, StartWrite and Advance.

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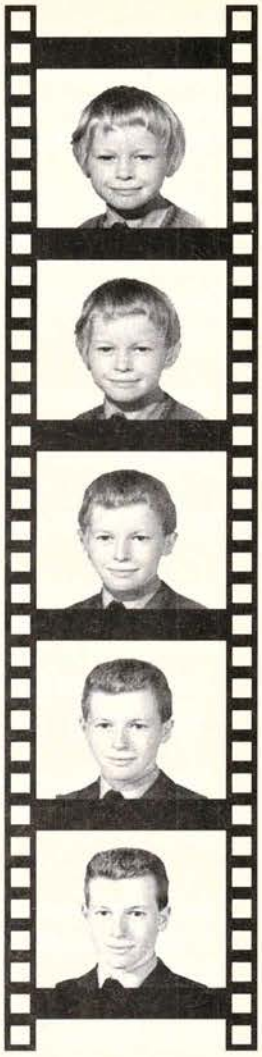

!Rephorm

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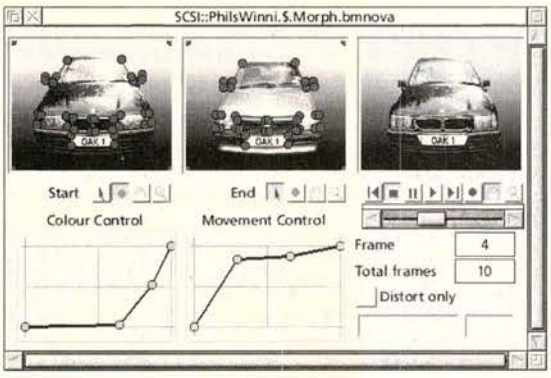

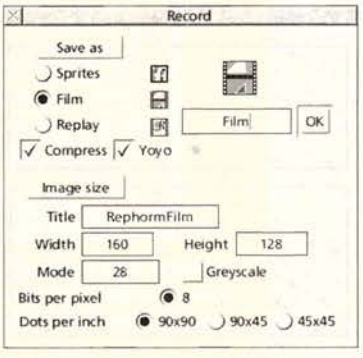

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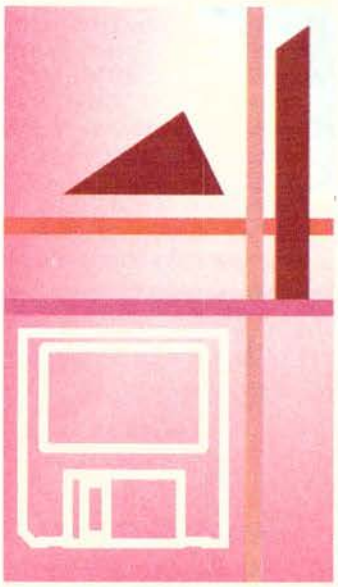
Reach for the bug-bomb

Is entomic research your secret passion? Michael Rozdoba examines a few specimens



DO you have an overpowering desire to cause actual bodily harm to several anonymous employees of Acorn Computers Limited?

If you are the proud new parent of a bouncing baby program which is suddenly struck down with an intractable bug, you may very well get this feeling.

It's probably only paranoia or more likely an overbearing and entirely unjustified self-confidence on your part – the mistake being in your own code.

However, it could just possibly be Acorn's fault – shock horror – there *are* bugs in Acorn's otherwise beautifully-crafted operating system.

This month we are going to take a look at a few of the lesser known ones.

Desktop shutdown

Any wimp application which edits data, thus containing a modified and unsaved file, must deal with the Message_PreQuit (8).

If you follow the RISC OS Style Guide, as of course you should, when encountering this message your program – if it contains modified data – should object to the prequit.

You then have the chance to ask the user whether to cancel the quit, resume or, possibly, save the unsafe file and then resume the quit.

If you decide to resume the quit and are operating under RISC OS 2, you must restart the desktop shutdown sequence by sending a Control+Shift+F12 key pressed event to the task which sent you the prequit message.

Some applications take a short cut by passing Control+Shift+F12 to Wimp_ProcessKey, as this is slightly briefer to code and *seems* to have the same effect.

What does this have to do with bugs?

Well, a prequit can originate from several sources. These include not only a shutdown of the Desktop, but also the Task Manager iconbar menu option *Exit*, and also the task *quit* option obtained by clicking Menu over an entry in the Task Manager window. Now, if you choose this last option you obviously only want to quit a single task. However compliance with the shutdown protocol will lead to the entire Desktop shutting down, if the application has to first query whether you want to discard a modified file.

RISC OS 3 provides a fix to this, as documented in the current PRM (3-232).

With R1 as returned by Wimp_Poll:

R1+0	24 (size)
R1+16	Message_PreQuit (8)
R1+20	flag word

If bit 0 of the flag word is set the application should just quit itself, rather than restart the closedown sequence.

This serves to distinguish between a complete shutdown and a single task quit from the Task Manager. But what about the difference between choosing to shutdown or just exit the Desktop?

Under RISC OS 3, a shutdown will lead to the *you may switch off now* message with the option to restart the Desktop, whereas the exit option should quit the desktop and take you to the command line.

However this seems to have been overlooked by Acorn and applications dealing with a prequit cannot distinguish between these two cases, nor automatically start-up the exit option.

Thus if a user chooses *Exit*, they may end up with an unwanted shutdown.

DragASprite

This can brighten up many an application working in RISC OS 3, with its solid sprite drags able to replace the old dashed boxes.

Unfortunately, from a programmers point of view there are several pitfalls, as this is a sickly creature and doesn't have the polished finish of most of the rest of the operating system.

Here are a few bugs I discovered earlier:

- Specifying vertical location of sprite as top-aligned won't work. The DragASprite module uses the sprite's width in a calculation when it should use height.

  This is a daft bug which I've managed to fix myself. See !DAS.!Help on the cover disk for instructions on how to patch your own copy of DragASprite.

- Applying the bounding box to the initial drag box won't usually work. It seems that if you set this option, DragASprite will calculate the minimal box enclosing the sprite within the initial box and will apply the bounding box to this box, rather than to the initial one.

  Thus unless the initial box is an exact match to the sprite size, this feature won't behave correctly.

- Although the Wimp supports 8 bpp sprite icons under RISC OS 3, DragASprite won't work with such sprites. What's more, if you try it, it doesn't even return an error. Instead, it either ignores the drag, or at the very least, messes up the colours.

VDU redirection to sprites

A final cautionary word:

Redirecting output to a sprite of height one pixel may fail. It looks as though all output will be ignored in this case. If you need to output to such a sprite, you will have to increase its height to two pixels before redirection and delete the top row afterwards.

Stop me, buy one!

Don't forget, 42 may be the answer, but we have yet to discover the questions. If you have a question, it is your duty to society to write in, so do it NOW.

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In addition there is an audio training tape which provides a step-by-step guide to your new RISC OS computer. Acorn are also including eight pieces of interactive demonstration software:

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What do you have to do?

Below are two pictures which appear elsewhere in this magazine – find the page each one is on and mark them on the entry form. Also complete the phrase *Acorn is the educated choice because...*

Fill in the entry form and make sure that it reaches the Acorn Computing offices before the closing date of 31 January 1994.

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Picture 1 is on page ____ Picture 2 is on page ____

Now complete this sentence with less than 25 words:

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50 with labels boxed in 10s	£20.00 b
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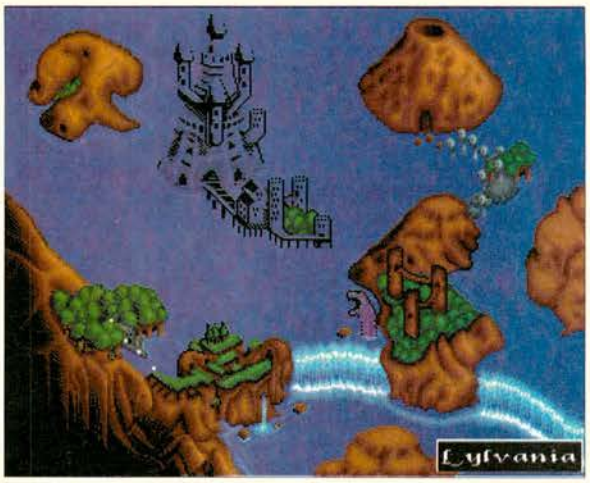
Warlocks

... snap, crackle and pop



● *The not-so-peaceful land of Lylvania*

WARLOCKS is Network 23's first game, although they released Provocator two years ago under the name RAGE, as well as several demos in the dim and distant past.

The plot isn't groundbreaking – three warlocks have transformed a pleasant land into a ghoul-ridden nightmare. As a powerful knight reincarnated from all the souls who perished at the Warlocks' hands you must eradicate all traces of evil from Lylvania.

The gameplay is structured around a platform-based shoot-'em-up, with simple puzzle elements cropping up in the later levels – essentially flicking the odd switch.

This all sounds pretty mundane, so what makes this particular game stand out? Firstly, the graphics are superb – they run in a modified Mode 13 screen, so that means 256 colours and lovely resolution. You get a snatch of music at the title screen which helps to set the atmosphere up nicely.

The technical side has been very well planned – the game is supplied on two disks, one containing the program and the other holding the levels. However, only one disk swap is needed when loading the program, and after that, you don't have to touch the disk drive again.

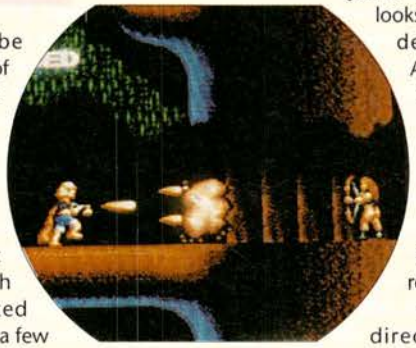
The screen display runs at 50 frames a second. All you need to know about display rates is that, at that speed, the animation is *smooth*. Parallax scrolling is also employed to create a feeling of depth, and watching the landscapes glide past each other can be entrancing – often to the cost of one of your lives, if you're not careful.

PRODUCT SPOTLIGHT

Price: £29.99 (inc VAT)
Supplier: Network 23,
73 Sylvan Avenue, East Cowes,
Isle of Wight PO32 6SJ.
Tel: 0983 290347

You start with a meagre crossbow, and if lucky enough to find any of the power-ups, you can change it for a set of fireballs or some magic bombs. There are 10 levels, with the three warlocks dotted throughout. There are also quite a few hidden rooms and shortcuts – there is one very near to the start, but I'll leave you to find it.

The levels vary in style, from the forest and castle to the cave levels, complete with pits of red-hot lava. My personal favourite must be the graveyard – lots of monsters to kill and some stunning special effects, with sheets of rain pouring from the skies and bolts of lightning lashing the ground.



● *Good, more fire power, I just wish I had that crossbow*

The gameplay is a bit misleading – if you're watching somebody else play, it looks easy. The truth is that a great deal of precision is called for. Although there are on average four monsters on screen, compared to, say *Xenon II*, where it's almost impossible to count them, the way in which they attack means it's very hard to defend yourself. The firefights look less stunning, but requires the same level of skill.

Joysticks aren't catered for directly – however, a textfile is supplied so that owners of the Vertical Twist joystick interface can easily create the correct module.

Warlocks is an enjoyable game to play, although it does get somewhat difficult and frustrating towards the end. The graphics, music and animation are excellent, but if you're expecting six-foot explosions and shards of grenades flying through the air, you're not going to get them.

The game has a strongly professional feel to it, with just a couple of rough edges, but if this is the standard of Network 23's second game, what will they be like in the future? I can't wait...

Hal

● *The end of level baddies are not the type you want to meet unprepared*

● *Secret passages and caves are easy to find – once you know how*

● *Creatures come in all sizes – don't let their cute appearance deceive you*

Haunted House

... things that go bump in the night

BEING interested in antiques, adventure games, puns and lateral thinking, putting all these on my desktop was bound to fire enthusiasm. Several days later, with little work done, I found myself stuck in the cellar and hooked on this latest Gordon Key masterpiece.

Not only are the scanned drawings really superb, but the detail and sound effects are pitched at just the right level. For anyone who played the Wimp game this is of a similar genre – being totally multi-tasking – but less frustrating and vastly more enjoyable.

The plot is simple – you are an antiques dealer employed on the task of a house clearance. Strange to relate, the owner won't come anywhere near the place; neither has he a key. But buoyed up by the prospect of numerous treasures to collect, you proceed.

The first hurdle is a gate and a particularly tuneful blackbird. A rucksack which you can drag on to the desktop will hold six items. When it opens you'll see a key. The gate is locked but it has a combination lock. Scattered on the floor are bits of paper. Now is the time to resort to Edit to keep notes on your own scrap of paper.

Red herrings exist but in the main everything will come into its own sometime. As with all such games, save your position often and especially before doing something risky.

Movement is via the arrows to the left of the main window but they can be misleading so be careful until you work out their significance. You open items and pick them up by clicking Select, while Adjust will give you a description. Pressing both buttons together may have an effect such as pouring out liquid or playing a note.

I would have liked to be able to click on a door to go through it rather than rely on the arrows, but you can't have everything (yet). Arrows are only highlighted when ways are open, which is useful as some exits are not obvious.

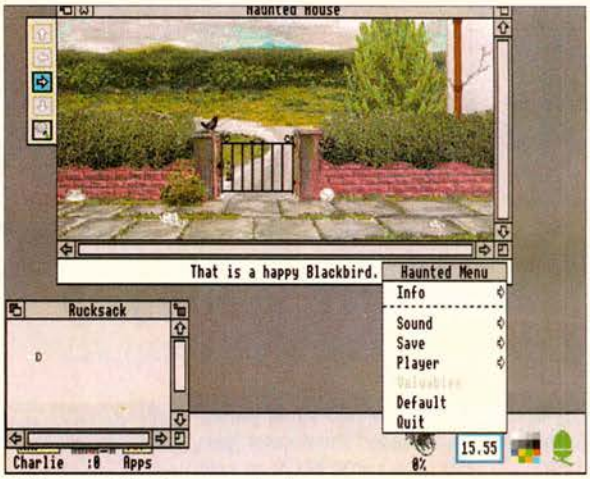
When you find your collectables pop them in the sack and take them back to the van. The key in your rucksack will open the doors. Remember though to close them again, as ghosts have light fingers. If you select Menu on the iconbar you'll find save facilities, volume and a list of what has been salvaged so far.

Some advice now. Look at everything, read all you find and make copious notes. Items can be put in or on others for desired results. Above all, think logically. Also don't automatically traipse back to the van with everything as you may need some items to access others.

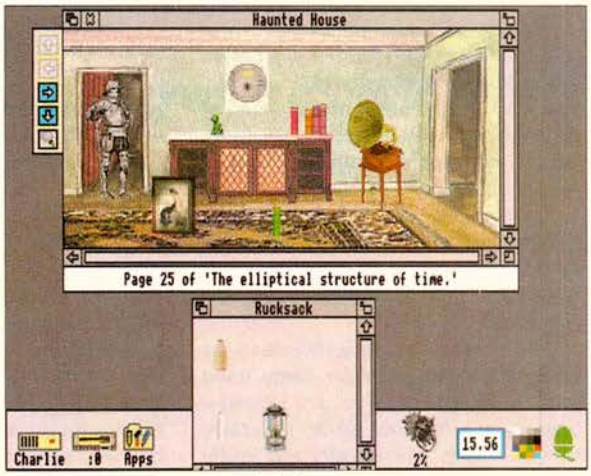
Under the iconbar icon – a door knocker – is a percentage indicator which shows how far you've got towards 100 per cent. This increases the more items are put in the van. Success is greeted by a fanfare, which will also sound when ghosts are removed, though some will talk to you instead.

My verdict? Brilliant. I thoroughly enjoyed it. I only escaped the cellar with a little help from 4D to find myself in another predicament. But they are preparing a hint sheet and Mad Hatter is on the job too. If you like adventure and mystery, buy Haunted House now.

Pam Turnbull

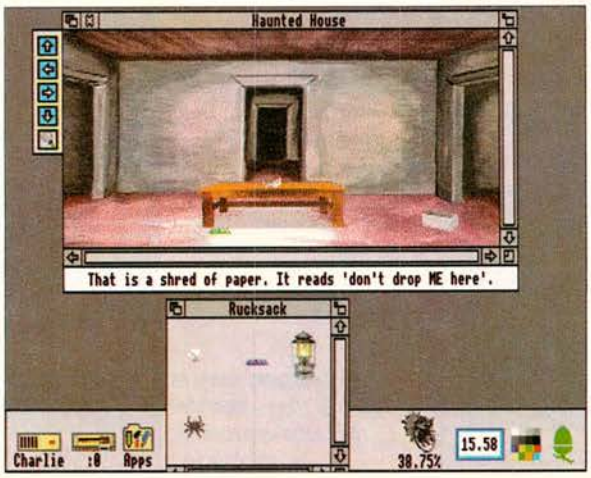


● *The quest for treasures begins*



● *What to do first, get rid of the ghost, open the safe or play some music?*

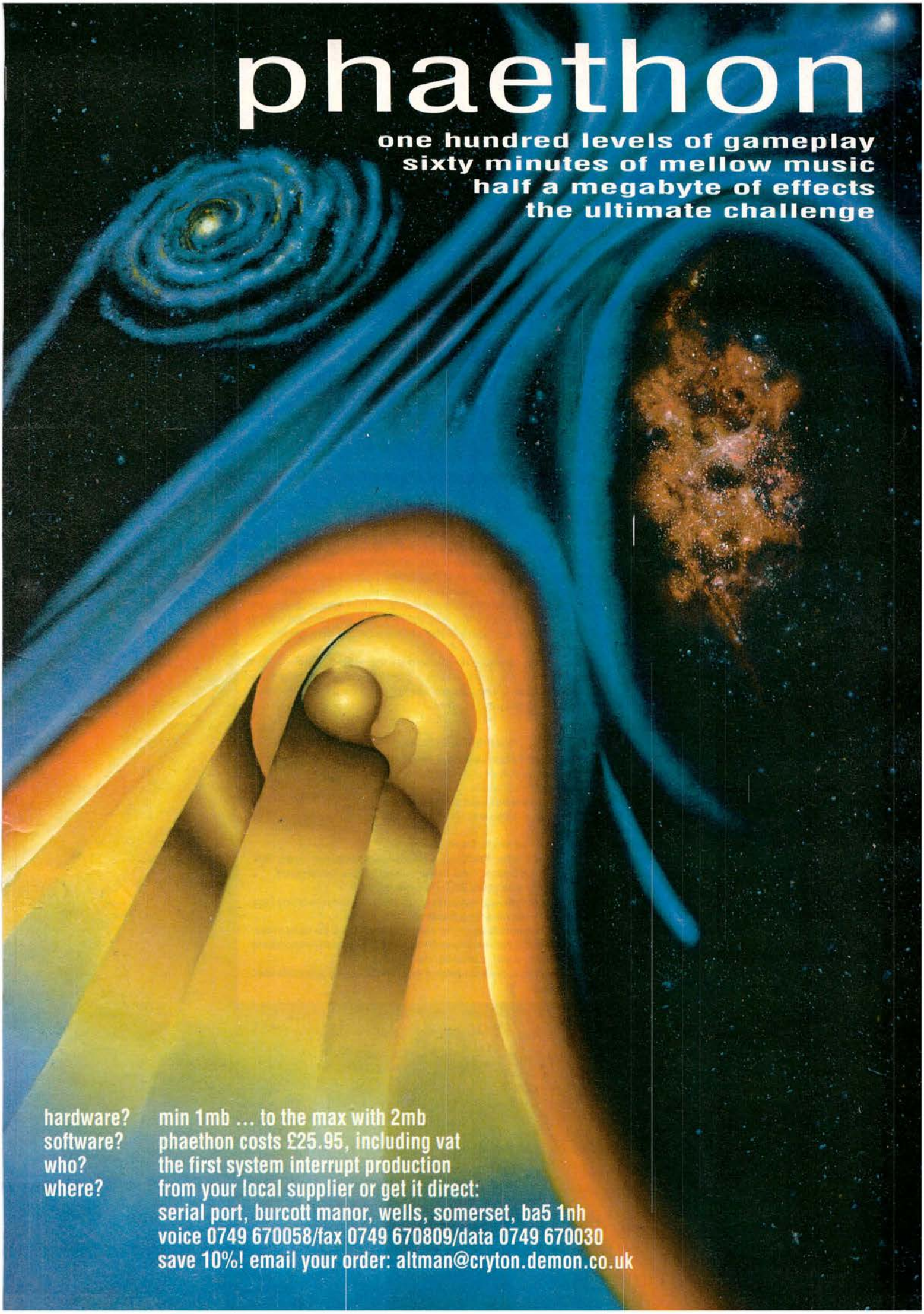
● *Not all ghosts are visible but most can be placated with a tune, bowl of milk or even a bell, book and candle*



● *There is much to find in the cellar – getting out is the tricky bit*

PRODUCT SPOTLIGHT

Price: £25.95 (inc VAT)
Supplier: The Fourth Dimension,
1 Percy Street, Sheffield S3 8AU.
Tel: 0742 769950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Stunt Racer 2000

'A game ahead of its time!'

- 2 Player QUALIFY -
Player Kris Mel
Result 5TH 4TH
Avg Speed 70.28 Mph 73.72 Mph
Distance 3.53 Miles 3.72 Miles
Cash Award Nil Nil
Best Lap 02:15.1 02:14.8

- 2 Player RACE -
Player Kris Mel
Result CRASHED CRASHED
Avg Speed 94.99 Mph 97.64 Mph
Distance 5.92 Miles 6.08 Miles
Cash Award Nil Nil
Best Lap 01:23.3 01:18.8
RACE SUSPENDED

The creators of *Chocks Away* are proud to present *Stunt Racer* 2000.

The year is 2037 and the world of motor sport has changed considerably to meet the demands of the excitement thirsty audiences. The World Federation Entertainments Network (Known as Fednet or WFE) broadcast Stunt Racer 2000 to a worldwide audience of over 750 million. Those who are brave enough to race can reap the rewards of stardom, wealth, fame and glory or be lost amongst the mass of failed Stunt Racer 2000 drivers. The racing season takes place on 16 demanding tracks over all terrains including desert, arctic and lunar tracks featuring a wide selection of jumps and stunts. After completion of all 16 tracks the top drivers will get to race on the Supreme Stunt Racer 2000 track which is the ultimate test of driving skill.

Stunt Racer 2000 has been carefully developed by the Fednet team over the last year and includes all the best features from other racing games and many innovative new features. The game is designed to be pseudo technical whilst keeping the easy to play arcade feel.

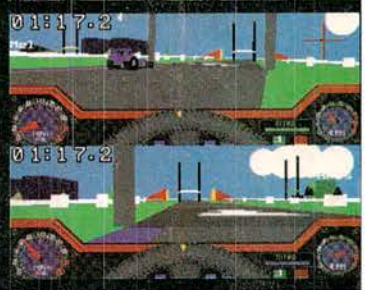
GAME FEATURES INCLUDE:

- Fast solid 3D vector graphic with a large selection of viewing angles and track side cameras.
- Lots of sampled sound effects and plenty of in-game music.
- Two-player split-screen or serial link options.
- Easy to use icon driven menu system to select the many features.
- 'Practice', 'Qualify' and 'Race' on a total of 19 varied and demanding tracks over 60 miles in length.
- Review your performance with the excellent replay feature.
- Vast selection of track pieces including Bank Corners, Various Jumps and Bumps, Moving 'Surf Track, 360 Degree Loops, Raised Sections, Track Hammers, Wave Bridges, Twister Jumps, Transporter Gates, Car Lifts and Acceleration Gates to mention but a few.
- Cash awards for winning races allowing you to increase your cars performance by buying Extra Tyre Grip, Increased Engine Power, Nitro, Mega Boosts and Car Scanners.
- Selectable gear ratios allowing you to fine tune your cars performance to suit the varied tracks.
- All player and computer controlled cars are accurately modelled using sophisticated alogrithms to calculate skidding, collisions, gravity, acceleration etc.
- Two player 'Killer' – destroy your opponent on specially designed tracks. Save player files and game configuration onto disc.

FedNet 25436 - 32

World Federation Entertainments Network

PG STUNT RACER 2000



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Access VISA

Birds of War

'FIGHTER PILOTS WANTED – YOUR COUNTRY NEEDS YOU!'

It has taken **four years** of dedicated work by the author ***John Whigham,*** to make a flight simulator so sophisticated, it could probably be used by the forces . . . It's name is **BIRDS OF WAR**

TECHNICAL:

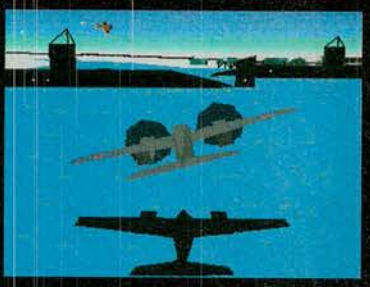
- Memory Required: 2Mb
- Amount of Static Graphics: 1.2Mb
- Amount of Mission Map Graphics: 1.4Mb
- No. of 3D Objects: Over 250
- Fast 3D Vector Graphics, up to *20 fps*
- Minimum configuration 2Mb – Arm 2
  Ideal configuration 2Mb, Hard drive, Arm 3
- Total Amount of Data: Over ***10Mb***
  Compressed onto six discs
- Briefing/Debriefing text: Over *86,000 words.*

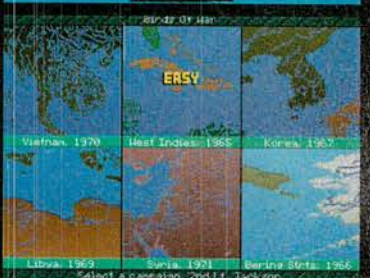
GAMEPLAY:

- No. of Planes You can Fly: 32
- No. of Aircraft Types: Over 50 including Helicopters
- No. of Eras: 4
- No. of Campaigns (areas): 24
- No. of Missions: 192
- Total Playing Area: 250,000 Square Kilometers *(down to accuracy of 1cm)*
- No. of Weapon Types: Over 40

OTHER FEATURES:

- Variable Detail Level
- Graduated Horizon
- Two Accelerated Time Modes
- Digitised Sound Effects
- Variable Enemy Skill Level
- Variable Landing Difficulty
- Full ***'Black Box'*** Flight Replay With Save Facility
- Low Visability Cloud Base Feature
- Object Depth Cueing
- 14 Different View Points, with Variable Pan Speed and Zoom, including internal or external views
- Missions may be in daylight or darkness
- Intelligent Computer Controlled Enemy Pilots – NOT Just Drones
- Wide Variety of Mission Types – Interdiction, Escort, Photo Recon, Air Drop, Retrieval, Air Interception, Ground Interception
- Fly Missions in various weather – Snow, Rain, Thunder, Sandstorms
- Up to ten pilots on roster – pilots can be carried through from one campaign to the next
- Realistic flight models capable of full aerobatics
- Full Mission briefing/debriefing sequences
- Interactive intelligence map for each Mission
- Select which Plane to Fly and Choose Your Own Ordinance





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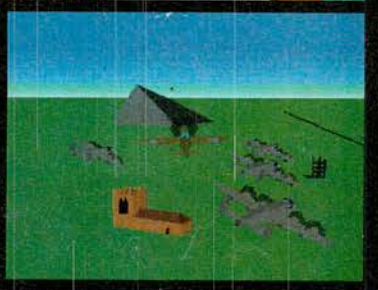
VISA Access

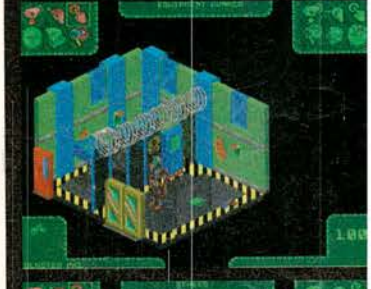
FLIGHT ROSTER
Pilot | Status | Missns | Total
1st Lt. Bradlee | Active | 14 | 0
1st Lt. Hellon | Active | 59 | 195
2nd Lt. Perry | Active | 17 | 680
1st Lt. Jackson | Active | 36 | 245
2nd Lt. Mitchell | Active | 10 | 0
1st Lt. Moth | Active | 30 | 780
2nd Lt. Harley | Active | 6 | 0
2nd Lt. Farr | Active | 4 | 1100
1st Lt. Thomson | Active | 20 | 351
2nd Lt. Jurikson | Active | 8 | 290
Use LEFT mouse button to select a pilot.
MIDDLE button for information or
RIGHT button to erase.

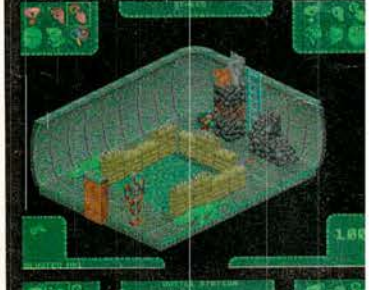


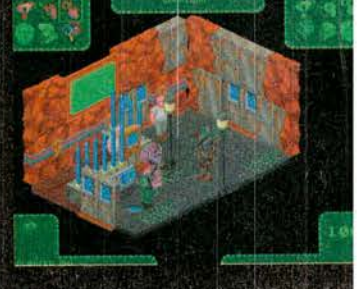
From the team of dedicated programmers who gave you *'Pandora's Box'* Comes The Sequel:

. . . 'Carnage Inc.'

'A Test of Honour and Courage'







From dazzling fire-fights to ingenious puzzles, Carnage Inc. will test your reflexes as much as your mind. Spanning 4 planets and over 200 screens this campaign will appeal to both warrior and sage.

BRIEFING:

In the year 2297 Earth comes under the control of an idealistic council which abolishes the use of weapons of war. When intelligence reports the presence of a hostile alien empire, a defenceless Earth is gripped by fear.

The council has no choice, it must commission Carnage Inc. led by the psychotic General De'ath, to fight on its behalf. Under this contract Carnage Inc. builds you:

A *Cyberkill Mk.III Battle Droid, 2.5m tall, titanium alloy and utterly deadly.*
Your Mission: To infiltrate, provocate and annihilate the enemy power.

GAMEPLAY:

Your battle droid will use grenades, flame-throwers, land mines and laser guns to penetrate enemy defences.

Engaged in espionage you deal with spies, cut communications, demolish genetic warfare labs, and ultimately destroy the alien space station.

. . . or die in the attempt!

TECHNICAL INFORMATION:

Frame Rate: 25fps

Graphics:
Enhanced Panametric System Allows Detailed Landscape and Rapid Arcade Action

Sound: Digitally Sampled Sound Effects

Computer: Any Archimedes with RISC OS 2+ and 1Mb

Enhanced sound effects on 2Mb Machines

For All 32-bit Acorn Risc Machines Requires 1 Megabyte £25.95

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Haunted House

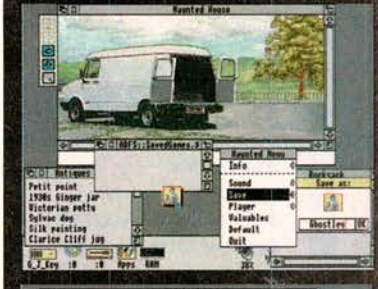
The dawn breaks onto a fine autumn morning as you slowly drive into the tiny village of Lower Pigglesthorp and make your way to the old house in Hobbs Lane. After parking your van to the rear of the building as you were instructed, you walk the remaining couple of dozen yards to the front gate, breathing the chill of the morning dew. The road is quiet and deserted save for a couple of blackbirds and the crow of a distant cockerel, *'it's going to be a good day'* you say to yourself . . .

In all the years that you have been doing house clearances this one does seem a little strange. Your client flatly refused to come with you, insisting that you would find everything that you would need on the premises. All he would tell you, was that the building had apparently been empty for some years and that there was a small fortune in antiques and collectables to be taken back to the auction rooms.
He didn't even give you a key to the front door!

***Oh!** there was some talk of ghosts but that's silly isn't it!*

SPECIFICATION:

- Minimum 2Mb RAM Required •
- Contains over 1.5 Mb of Sprites •
- 99.5% of Graphics are Scanned •
- ARM 3 Enhancements •
- Has over 50 Different Sampled Sounds •
- Fully RISC OS Compliant •
- Full Save Facility Allowing Progress to be Recorded •
- 2 Discs •
- Animated Graphics to add to the Ambience •
- Hard Disc Compatible •
- Deliberative Lateral Thinking required for the often Humorous and Teasing Puzzles •
- Percentage Completed Indicator – ***Can You Reach 100%?*** •



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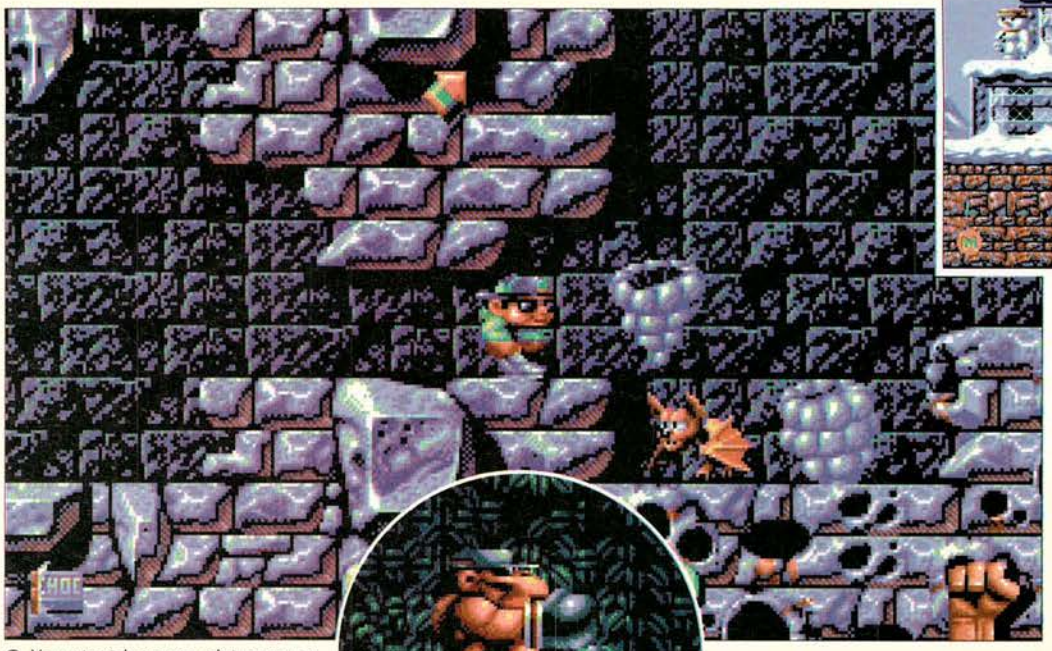
● *This snowy environment is fun – rolling snowballs and killing all and sundry*



● *You start in some picturesque caves. Thank goodness for raspberries ...*

● *The bonus levels set different challenges. I feel a little lightweight on this one*

Magic Pockets

...never knew there was so much in it

IT IS good to see Renegade making their debut into the Acorn arena. We have seen their work before, courtesy of Krisalis, but Magic Pockets is the first conversion they are testing the water with themselves. If you enjoyed Gods and Zool then Magic Pockets is definitely for you.

Betty Boo music accompanies the Bitmap Kid and his mystical trousers with their magic pockets – magic because you can hold anything and everything in them. Great, but there is a catch. It's difficult to find things in pockets so big, especially when inhabited by PocketLand people who too like playing with your toys. Out comes the black hole and in jumps the Bitmap Kid with vengeance on his mind.

Not quite the strangest scenario in the world – but close – as you traverse a platform world of strange creatures, snails, orcs – Rocky People actually – frogs and probably puppy dog tails though I haven't found any yet.

You enter four worlds and from each must rescue a favourite toy. In the caves is a bike, boxing gloves in the jungle, with a diving helmet and space hopper found in a lake and on a mountain respectively.

On the way use those spacious pockets to store huge raspberries as well as sweets, bonuses and magic items which *happen* to appear.

Some of the inhabitants are real meanies so be prepared to prove yourself before leaving. I loved the movement as you peddle furiously away from the caves. Don't hang about, not that there is a time limit, but the *Bubble* is to be feared. Wouldn't you say so Number 6?

Whenever PocketPower is used to dispatch one of the baddies an arrow appears indicating the way you should be going. By the way, not all walls are solid and bubble gum can be quite uplifting. Hold down fire and your pocket will get bigger – there are four sizes to choose from.

Acorn purists don't like conversions, but Atari and Amiga players expect a lot from their games and if Acorn users benefit, I'm not one to complain.

Pay special attention to the poster which comes in the box. Here discover the secrets of magic potions and wheelies, as well as the advantages of collecting cocktails, milk bottles, coffee, drinks of pop and fruit and stars.

I like the snowballs which can be rolled to become bigger and more destructive. Helmets are useful too, protecting, transporting, lasering or instantly annihilating your opponents. I particularly liked the cloud transport with their killer raindrops.

It's important to take account of what is happening off the play area. Holding down fire will increase the size of what you are firing, but pay attention to the cycle of sweeties on the left and power-ups on the right.

Careful manoeuvring will allow you to predict when to expect to receive a silver or gold star. Remember the number of silver stars collected before you get a gold one dictates the type of power helmet received. Silver followed by gold will send you to pastures new.

The more you play Magic Pockets the more you get out of it. Learn the scoring system, access the bonus levels of bike racing, gorilla boxing and the like and you'll be well hooked. This may take some time but it's fun learning.

Remember to make a note of the passwords which appear every two levels. Also practice those jumps, spins and rolls – you'll need them.

There is an awful lot in Magic Pockets, from secret bonuses to TV sets which reveal the levels. The detail is fine, gameplay addictive, graphics large and the movement smooth as can be. It's an enjoyable romp with that bit extra to put it high on my play list.

Teri Paul

PRODUCT SPOTLIGHT

Price: £25.99 (inc VAT)
Supplier: Renegade, C1, Metropolitan Wharf, Wapping Wall, London E1 9SS.
Tel: 071-702 3644

● *Moving on to the jungle I think I'll try getting my head out of the clouds and my feet on to them*

● *I don't like spiders, especially when they are big and coming my way*

Small ... is dangerous

PRODUCT SPOTLIGHT

Price: £24.95 (inc VAT)
Supplier: Virgo Software, PO Box 44, Stockport, Cheshire SK7 4QY.
Tel: 061-456 0009

VIRGO is another new company on the scene with a unique game, this time using texture mapping to good effect. The scenery was created using Illusionist and is very impressive indeed. The scenario is strange – the *Others* have cast you into the labyrinth of your mind and there are only two ways to escape: Find the exits or die.

This is a maze game introducing increasing difficulty and complex labyrinths full of dangers and treasures. All in all, not a very nice place. I mean, would you choose to have your mind full of spiders, hermit crabs, globules of acid and hunks of rock?

All these are set in a series of larger and more complex mazes – thank goodness for the automatic mapping feature. There are treasures, potions, shields and shuriken galore, so you can get your own back. Or at least try to.

The point of the experience is to get out as fast as possible, which is more difficult than it seems – just watch the bars for health, time and ammunition rapidly disappear. Run out of time and death ensues.

A fourth bar measures the numbers of bombs collected. Believe me, you'll need them as you try not to be bitten, burnt, electrified and generally eliminated.

Players receive encouraging – and sometimes painfully obvious – remarks on progress or lack of it. Always take such advice, especially when it relates to the bouncing balls. These are harmless, but if shot your energy will increase. Try turning sideways to get a better shot.

Teleporters will be found and, as all the map is used, if you can't get to a certain portion be sure that you've missed something. I particularly disliked the teleporters situated behind traps. You ended up completely stuck if you don't move fast enough or you find yourself in a box and have to shoot your way out of.

I found the best way of coping with traps was to move fast and keep moving. The same applies to the fire bursts, though if you prefer the more subtle approach try timing it.

The puzzles are intriguing. Getting the bombing just right is vital and above all you must keep moving. Small is different, graphically beautiful, unusual and infuriating. On both programming and gameplay, Small is a winner.

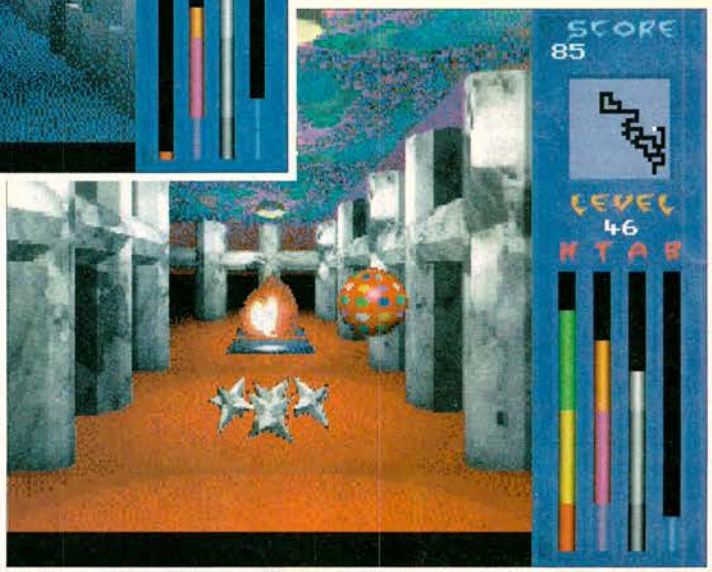
● *If you want to see Small for yourself look out for the MegaDisk on the January issue of Acorn Computing on sale December 30.*

Pam Turnbull

● *Disappearing hermit crabs open fire, and these eyes paralyse you*

● *Watch that acid cloud – shoot at it and it'll drop even more acid*

● *An unwritten adventuring rule is that statues always animate – it's true here too*



● *Wonderful graphics and the possibility of more ammunition and energy*

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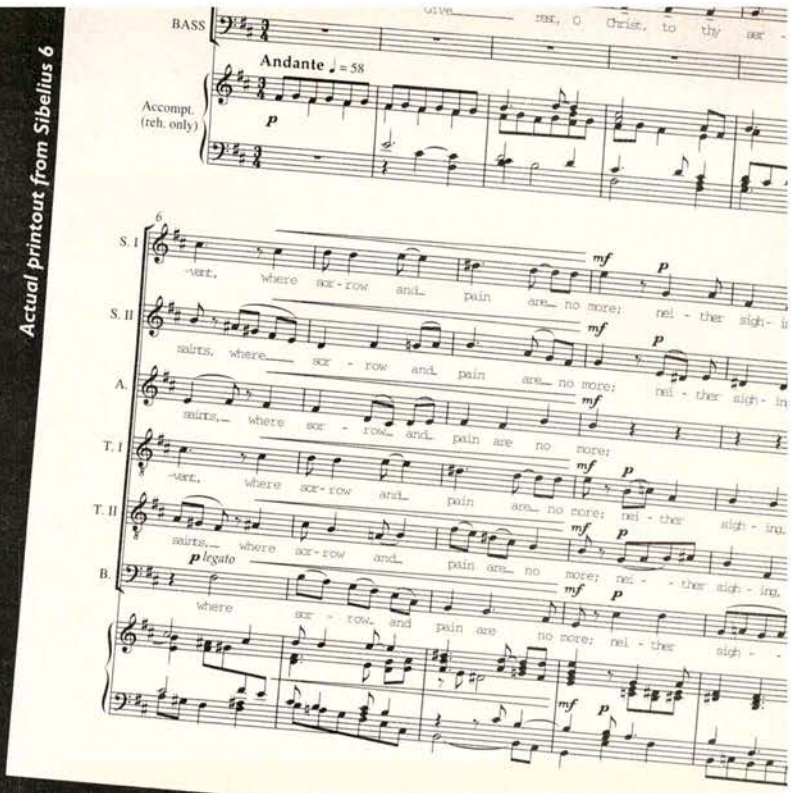

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Future Music magazine (August 1993)

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THE DUNGEON

THE DUNGEON

Created by MARTIN DENNETT
with assistance from JOHN PARKER,
DAVID POSTLETHWAITE and GORDON KEY.

-o-

They had found the entrance, overgrown and carefully blocked up, near the top of a cliff, just as on the parchment . . .

. . . Without warning, the floor they had moved onto dropped almost imperceptibly downwards with a sharp click and gaping holes opened up in the path in front and behind them, leaving them stranded on a pillar of rock. Moroth cursed their stupidity at falling into such a trap, and at that very moment the floor under their feet also vanished and they tumbled and slid down and down, to land dazed in a heap on a wooden pad in a small room far below . . .

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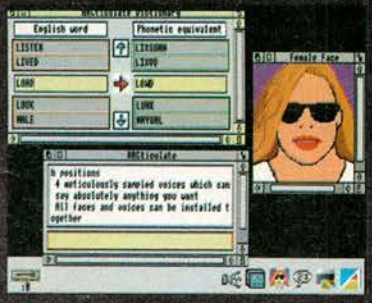

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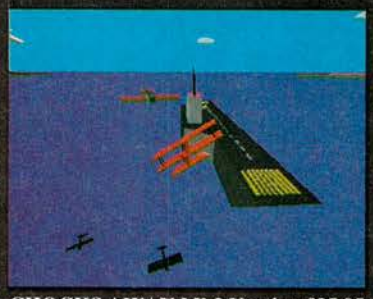

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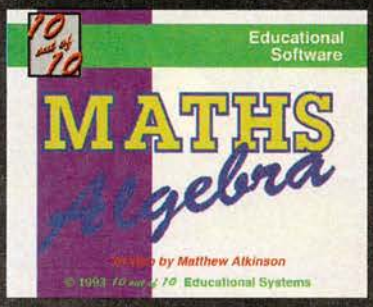

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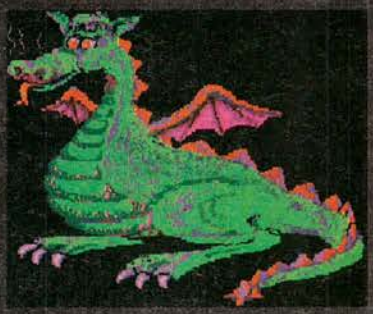

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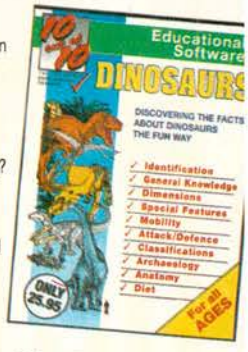
Dinosaurs

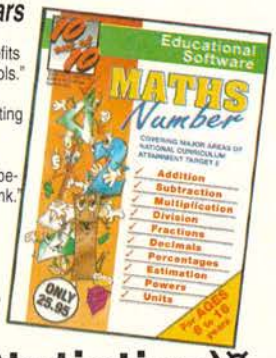
For all ages



This package is the fun way to learn the truth about dinosaurs. The six games all have superb digitised graphics to make a whole area of history – dinosaurs – come alive.
If you came face to face with a tyrannosaurus would you run away? Or are you safe because it's a vegetarian and wouldn't eat you? This, together with 100s of other interesting facts, can be discovered from this enthralling package.
The six games – all with single and multi-player options – are educational fun for everyone.

Maths (Number)

For children 6 to 16 years



"Well thought out to offer real benefits to children studying in British schools." – *PC Plus (July '93)*

"Educationally worthwhile and exciting to play – a rare combination." – *Archimedes World (December '92).*

"Unique in home-based programs because of the National Curriculum link." – *The Micro User (September '92)*

"Excellent for reinforcing specific mathematics knowledge." – *Junior Education (July '93)*

"The 10 out of 10 Series lives up to its name." – *PC Home (August '93)*

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For children 6 to 16 years

"Everything being done is relevant to the player's education. An invaluable curriculum experience, plenty of fun, lots of variety." – *PC Home (November '93)*

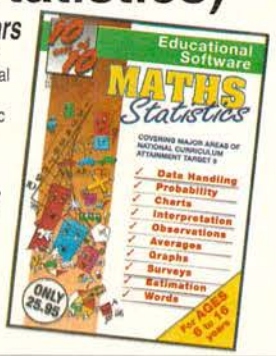
"Guaranteed to sustain the attention of even reluctant learners." – *RISC User (January/February '93)*

"Most importantly, as the games are fun, children can't help but learn." – *Acorn Computing (March '93)*

"Allows progression from Junior school age right up to GCSE level ." – *Amiga User International (Sept. '93)*

Maths (Statistics)¤

For children 6 to 16 years



Attainment Target 5 of the National Curriculum is Data Handling – a vital area of Mathematics. *10 out of 10* Maths (Statistics) covers 36 specific topics from that subject.
In this package, recording animal sightings in an animated pond or rolling dice are just two of the many challenges that children will relish as they learn about statistics. And can graph drawing be a game? It becomes arcade action as bricks and bombs are dropped onto the charts. This is a really enjoyable way to learn about statistics.

French¤

For children 6 to 16 years

This suite of six educational games will give fun and motivation to all children learning French. The package is designed with the Modern Languages National Curriculum firmly in mind and contains many challenges to reinforce facts stated in Attainment Targets 3 and 4.
10 out of 10 French is essential for children on Key stages 3 and 4, but the numerous parent and teacher customisation options make the software suitable for all children – however young – who are learning the French language.

Driving Test¤

For all drivers and learners

Whether you're a novice learner or an advanced expert, there's plenty you can learn from this package. There are thousands of built-in questions and you can choose whether you want to answer them directly or add to the fun by trying them within games.
The six games have been designed to be fun for all adults and include strategy, mental agility, coordination and more. And, if you think you are up to it, you can "*take the test*" – a challenge covering many areas of the Driving Test.

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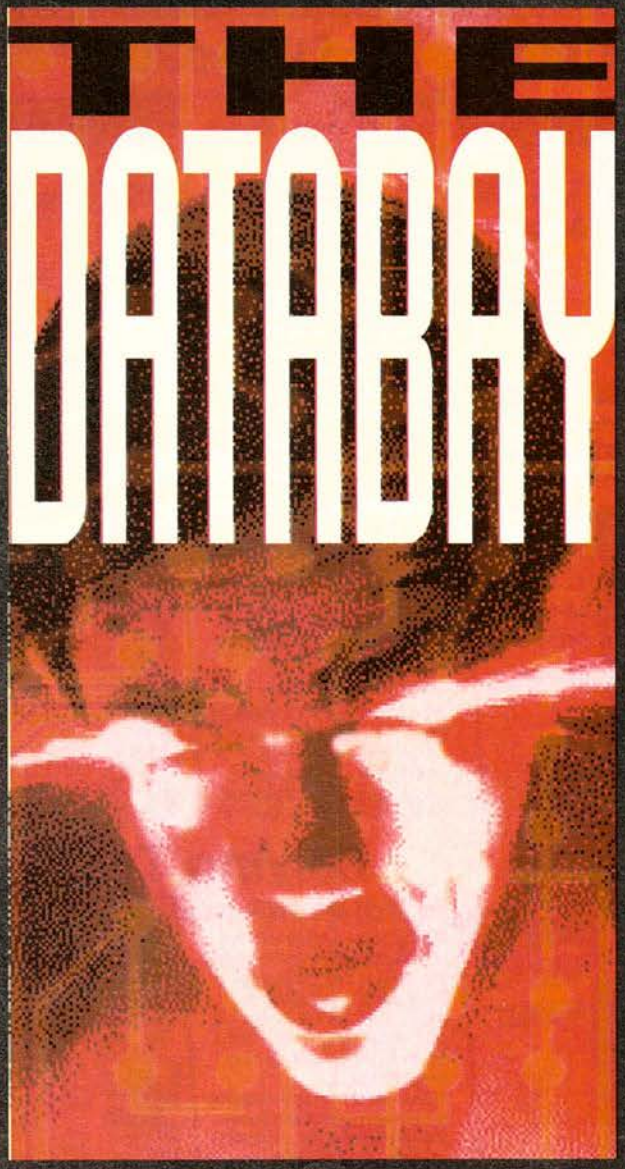
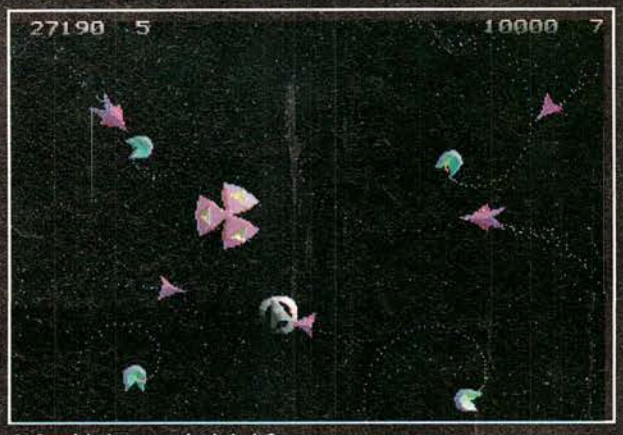
The 10 out of 10 Series is available for Acorn 32-bit computers (Archimedes), Commodore Amiga and IBM/PC and compatibles. If you buy any two items before Xmas 1993, £15 will be deducted from the total price. At the time of going to press, titles marked ¤ were not available on all formats and may not be released before Xmas. They may however be ordered at the offer price. Please ring for availability.

The *10 out of 10* Series is available from all good computer software suppliers



HAL boots up the virtual snow for the Christmas Special



● *So this is your dad, is it?*

THERE were some impressive pieces of software floating round at the Acorn World Show and most of them will be coming your way in the near future. Two to watch out for are from the keyboards of TBA, and also FedNet, the authors of Stunt Racer 2000. They both take the form of three-dimensional futuristic shoot-'em-ups, and the animation on both is breathtaking – some of the smoothest 3D graphics I have seen.

TBA say that their offering will be ready before next spring. FedNet weren't that specific, but keep your eyes open – it might pop up at any moment.

Gamesware's stand was surrounded by happy games players putting James Pond 2 and the PowerPad, among other things, to the test. Simon the Sorcerer looks well under way, and with the intricate graphics and wickedly sharp humour, it should be a big hit.

Oregan will be continuing their recent games commitments with the release of Arcturus – a three-dimensional Zarch-style game in which you drive a Jeep over a smoothly-shaded hilly terrain.

Programmer's profile

Last year a game was released that looked so new and dynamic that its title was on everyone's lips for some considerable time. It has been upgraded several times and is now in its latest incarnation, looking more colourful and chaotic than ever. It's even rumoured to be one of Dominik Diamond's favourite games.

Its name is Spheres of Chaos and the programmer is Iain McLeod. We managed to buttonhole him at the show and ply him with questions of a most demanding nature:

Iain, how did you get into programming?

Initially, from my interest in electronics. My father had a supply of electronic junk with which I experimented and made widgets. My first experience of using a computer was playing Noughts and Crosses on a wardrobe-sized PDP11, and I did my first programming on a PET in one of the labs. I got an Acorn Atom for myself in 1981, in a build-it-yourself kit form. Later on I had a BBC, and finally in 1988 I got an A310.

What gave you the idea to write Spheres of Chaos?

Money! Or, more specifically, the need for some. In January 1992 I found myself unemployed having been let go by a local games development company but I was also free to write whatever I liked without it automatically belonging to my employer, so I set about coding.

Whenever I write anything it has to go as fast as possible, which is why I use an Archimedes, and use all of the machine's abilities to the full. I liked the old arcade game Asteroids so I thought I would write a version of it. The first had one ship, spheres only, and no power-ups or sound. I sent it to a company called Atomic Software and was contacted by Matthew Fifield.

Eventually, Atomic decided they didn't want to release it because their previous two releases hadn't done very well. However, Matthew, alias Matt Black, decided to publish it with the improvements, and it appeared this time last year.

What do you think makes a good game?

Playability, mostly – there are different ingredients for different games. For arcade type ones like Chaos, I think that responsive controls, a fast frame rate, gradually increasing difficulty, several types of game object and extra lives for scoring are most important. With this sort of game there's no danger of reaching the end and not playing it again. For adventure type games, the bigger and more complex the better.

What's your favourite Acorn game?

I haven't actually played a great number of Acorn games. I quite like Dungeon because of the rather nice graphics routine and the large environment to explore, and I liked Zarch because it was different graphically. My favourite of all time, though, must be Defender.

Which game would you like to see converted?

David Braben's PC racing game looks rather good – and of course there's Elite II!

Have you got any tips for hopeful programmers?

Structure, order and readability in your programming is incredibly important – the more

structured your program is, the easier things are to modify, and the less chance you have of getting weird bugs. Comment everything, using whole sentences if necessary. They have no effect on the final code, but they do make things much easier to understand when you revisit your code six months later.

Write something good, please, and original if possible. Everyone has written R-Type, or that platform game where you collect the widgets so you can get to the exit. The more different your product, the more likely it is to be noticed. Give the game a polished look. Frills are important, such as loading screens or clever graphical effects.

Finally, are you working on anything at the moment?

I'm writing a multi-player car racing game, with the cars' behaviour similar to that of rally driving. I want to use some effects like the pixels in Spheres of Chaos for smoking tyres and spitting gravel. There will be extra equipment for the cars, as well as a league, different types of track, and possibly some music this time.

Hint Helpline

Following on from the tips in the last Databay, here's an extra slice of advice for the plasma-packed Paradroid 2000.

Take some time to get used to firing and moving diagonally – since all the computer droids are adept at it, you can be at a disadvantage if you stick to the straightforward four directions.

Two of the most useful robots are the messenger droid and the machine-gun carrying sentinel. Speed is of the essence in Paradroid, and they both have it. The messenger is particularly nippy and the sentinel's rapid-rate firepower can tame the mightiest of droids.

When in the transfer game, try to leave the splitters until last, and activate them just before the time limit. This can allow you to beat droids with superior intelligence because they simply do not have time to respond to your move. Lastly, take advantage of the cells that your opponent couldn't possibly change, due to missing connections or colour changers.

If all that isn't enough, have a look at the module on the Megadisk, or try the cheat mode. Start the game, pause it and hold down the keys C, 2 and T on the main keyboard. While those are pressed, hold down a key on the keypad relating to which level you want to jump to, and finally press Escape. You will return to the main title screen, and if you start the game again you will find yourself at the start of your chosen level. Unfortunately though, this doesn't stop you getting blown to bits.

C. J. Nield wrote in to ask for some help with Pandora's Box, so here it is. While you are playing the game, hold down the right Alt key and the function keys F8, F9 and F10. This should make you invincible, and give you the added benefit of being able to walk on water. However, watch out for large pits as once you have fallen in, you will not be able to get out again.

If you've been trying to play The Crystal Maze from floppy disks and you're lucky enough to have a RISC OS 3 machine with a high density drive, I have some good news for you. It's just possible to fit all the files on to one high-density floppy disk, meaning no more disk swapping.

All you have to do is to install it as suggested, but without the CLib or FPEmulator modules in the Modules directory inside !CMaze – your RISC OS 3 machine doesn't need them. Remember to write-protect your original disks though – we don't want any costly accidents.

For the newest version of Spheres of Chaos, the cheat mode has been radically altered. It is still accessed in the same way, by pointing to Player 1's lives on the main menu screen and clicking Select 50 times, but you can do much more. Try it to find out.

T-Factor

A new games team has formed to bring you professional games with polish and pizazz, and alliteration, and their name is T-Factor. They consist of Simon Clay as programmer, Teresa Daniel in production and Ray and Sara Maidstone on music and graphics. While mere gamesplayers are tucked away in bed this dedicated team of

● *Aha! That's better – the cheat mode*

● *T-Factor's first game – but what does the T stand for?*

individuals strive at their individual tasks. Their first game is called Bowl-a-droids and will take up to five players at once, so invite your friends round.

They have written their own sound routines to bring you soundtracks as yet unheard and unimagined on the Acorn range, the music fed in through an in-house MIDI setup for extra realism.

Bowl-a-droids combines all-out destruction with the possibility of actually having to cooperate with your teammates, as your enemies, the Droids, do fight back. To clear the way of objects and enemies you have to bowl a bomb, wait for the fuse to die and stay out of the way. The bomb will incinerate your opponents, as well as stunning any it rolls over before exploding. The game automatically compensates for the processor and RAM that you own so it runs at the best speed for your machine.

Future plans depend on the success of Bowl-a-droids but if all goes well, you could well see a large interactive adventure, and hardware tie-ins for some more ambitious projects.

Contact T-factor through

➤

Magnetic Image at 0603 402819 for news of a limited edition demonstration version of Bowl-a-droids.

The 1993 HAL awards

Unfortunately, quite a few hopefuls didn't make it in time for this ceremony, but here are a few of my choices for outstanding games of 1993.

Stunt Racer 2000 – A great game to play with a friend, this three-dimensional racing game gives a strong sense of movement and excitement, even though you can see through the scenery at times.

Paradroid 2000 – A conversion of a classic strategy shoot-'em-up. Easy to get into, but difficult to become a true master.

Axis – What can I say? A truly original shoot-'em-up that promotes wild disorientation in novices. Watch out for a possible Axis II, with even faster rotation and graphics.

The Crystal Maze – Wonderful graphics, addictive gameplay, and not a harmonica in sight!

James Pond 2 – A platformer with body, this should keep even the most seasoned of players going for some time.

Warlocks – Atmospheric graphics and sound make this shoot-'em-up very impressive, although the guardians are a bit static.

● *So why did it get a HAL award? Just look at those graphics*

HAL's Christmas Plea

I've been meaning to mention this for some time now, and I think that this is the best opportunity, what with New Year's resolutions almost upon us.

How many times have you been working on an impressive high score on your favourite game, only to find yourself back at the menu screen without warning? I have witnessed this all too many times in several big-name games, and the situation tends to get ugly pretty rapidly.

The culprit is something known as a keyclash – it's when several keys are held down together, and the computer gets confused and thinks another key is being pressed. The common clash occurs when three of the standard movement keys are held down, and the key that the computer thinks is being pressed is in fact Escape.

In a lot of games, Escape is the button you press when you want to quit. So get over-enthusiastic with the keyboard, and you could well find yourself without so much as a high score.

To get to the point, my plea is this: Programmers everywhere, please remember our dear friend the keyclash, and try to avoid ones which dump you out of the game – it would make us all a lot happier, and prolong the lives of many an Acorn machine.

Thank you for your support.

Connection lost

Well, that brings us to the end of the first Databay Christmas Special – I hope you've liked it. I'm off to rest my NiCads now but I'll be firing up the Databay again soon, so if you have any comments, ideas, cheats or tips, please write in. The Databay is here to cater for all your gameplaying needs, so get involved! Please enclose a stamped addressed envelope if you want a reply. Enjoy Christmas and the New Year, and I'll see you here soon.

Passcode Corner

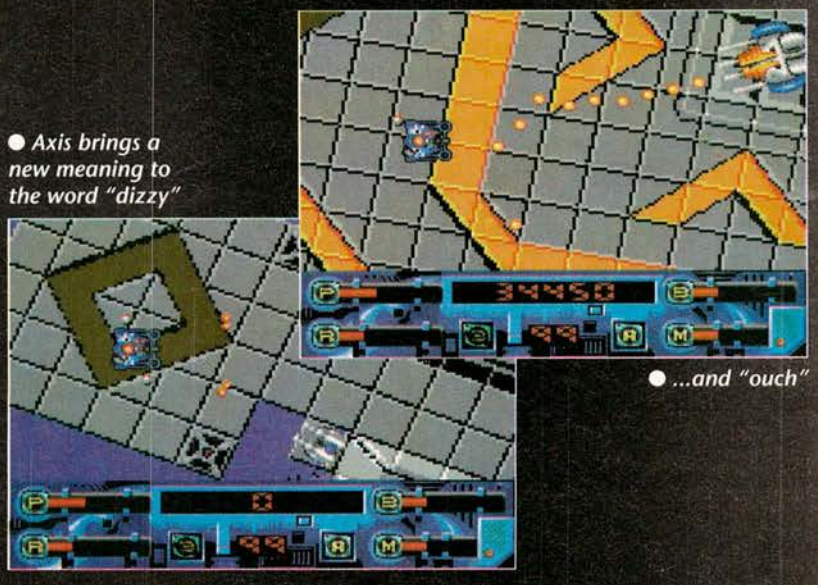
To make your passage through **Repton 4** a little easier, here is a list of passwords, courtesy of Andrew Clover:

2	ELEPHANT
3	COMEDIAN
4	SKELETON
5	ELECTRIC
6	RIFLEMAN
7	ORIGINAL
8	DISASTER
9	FLATBOAT
10	CREATURE
11	MOTORIST
12	DOGHOUSE
13	QUESTION
14	GIMMICKY
15	WORDPLAY
16	HORRIBLE
17	BUNGALOW
18	GRACIOUS
19	RESTRICT
20	DOWNTOWN
21	EMBLAZON
22	VOLATILE
23	EVACUATE
24	RIFFRAFF
25	IMPINGED
26	OINTMENT
27	DROWSILY
28	ANACONDA
29	SELECTED
30	BEQUEATH

D. Paisley has written in with the passwords for **Pesky Muskrats**, suggesting that since the game gets so difficult, most people will have given up by now and forgotten it. If that applies to you, and you feel a renewed need to see the game through to its end sequence, here are the codes:

1	EEKY EEKY EEK
2	HUMBUG
3	SQUAWK SQUAWK
4	THINGUMMYJIG
5	MOULDY CHEESE
6	FURRY RODENT
7	FUNKY AND FURRY
8	GREEN BANANA
9	EMU EGGS
10	EGOR
11	MUSKRATCASSEROLE
12	SILLY SOCKS
13	JERKIN GHERKIN
14	BOOGIE ON DOWN
15	UNSTOPPABLE
16	FURRY FRANKFURTER
17	PUMP THAT MOUSE
18	GET DOWN ON IT
19	TRIP ON THIS
20	TWIGALELL
21	SILLY SAUSAGE

Why can't games have *normal* passwords?



● *Axis brings a new meaning to the word "dizzy"*

● *...and "ouch"*

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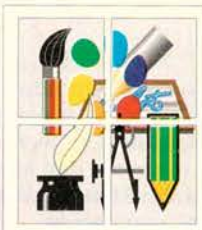

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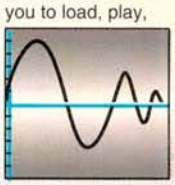

Happy Christmas

We would like to take this opportunity to wish all readers, & especially our customers, a Very Merry Xmas & a Happy New Year.

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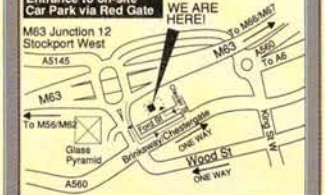

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Personalising your

WHEN I turn on my computer I want to get to work – or play – as soon as possible. I expect the programs I use every day to be loaded or at hand without having to go delving into numerous directories.

Having graduated from PlaceIt on a RISC OS 2 machine I was somewhat disappointed with the Pinboard initially but it does the job.

You may think that setting up a boot file and organising the sticky backdrop is really only relevant to hard disk users. True, it is easier but if you have a floppy system it's not too far outside the realms of feasibility to create a set of disks which are demanded each time your machine is set up.

We're going to set up a boot file which arranges your machine to look like the first screen below when you switch on.

A machine without a boot file has a very clean and empty desktop and if you prefer it like this that's fine too. You can personalise the name of your hard disk very simply, and if you are going to create a boot file, modify the hard disk name first.

I have now loaded a number of things into my machine. I have double-clicked on Acorn's RISC OS 3 NewLook icons utility which gives a range of nice looking backdrops and alters the scroll bars among other things.

I have decided that I want a number of programs stuck to the backdrop ready to be loaded: but I want Impression loaded and sitting on the iconbar each time I turn on.

Now that the iconbar and backdrop are set the way I want, all I have to do is save it. If you click Menu over the Acorn icon you find a Desktop Boot option.

Make sure the *Auto boot* button is clicked. It should force the machine to boot from the drive you drag the boot file to, but it doesn't always work.

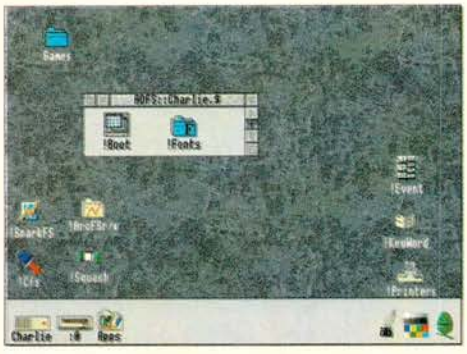
If it doesn't ,check out the letters page in this issue for a fix. By the way don't be tempted to change the filename from !Boot. Though you can do this, the file has to be called !Boot to work.

Just drag the Desktop Boot icon to the top level of your hard disk – the first window which appears

● *Your favourite or most used files are instantly accessible or already loaded*

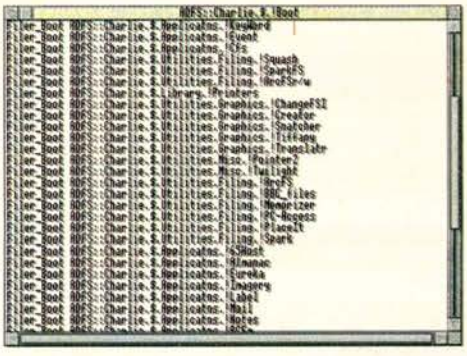
● *A less exciting desktop but your starting point. You can call your hard disk anythng*

● *Load what you want where you want it as a first step*



● *I for one, don't want to see this window each time I turn on...*

...so I open the !Boot file and start to edit the contents



● *I'm not going to want all of these in here, useful though they are*

computer

Pam Turnbull takes you through the steps to create your own RISC OS 3 boot file

when you click on the hard disk icon – or System disk if you only have floppy disks.

Now turn your machine off and on. You'd expect to see the desktop we've just put together. Well, you do and you don't. You may even be asked to put in lots of floppy disks – we'll deal with this in a moment. All the programs are loaded and running where you wanted but the top level directory window is open which you may not want.

A minor problem but let's take a look at the actual boot file. Holding down the Shift key double-click on !Boot, the file will load directly into Edit for you to have a look at.

Open this to its full size and scroll through and you may well see a lot of programs mentioned which you don't want. These programs are eating memory as well as being untidy and if on floppy will require you to find the disk every time you switch on or do a hard break.

So let's get rid of them. Just click on the correct line to place the caret there and press Control+Copy to wipe the line instantly. Remember to press F3 to save your amendments.

If you don't want the directory opening up do the same with the line:

```
Filer_OpenDir ADFS::Charlie.$ 174 7
28 450 140 -sn -li
```

You should now have a window similar to this one.

Leave the Resources, Fonts, System and Scrap in the file whatever else you load.

WimpMode 27 Sets the default screen mode. So if you always wanted to start in Mode 28 just amend this line.

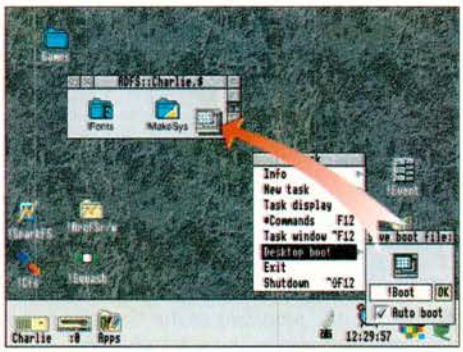
Desktop_SetPalette If you want a different palette change the palette icon on the iconbar before you do your Desktop Boot save.

You'll notice that the applications I've chosen appear twice. Once with Filer_Boot and once as Filer_Run files.

You can remove the boot line if you want but I prefer to leave it as some applications need to be booted before they're run. When it comes to a virus checker I usually boot it but don't run it so it isn't on ➤

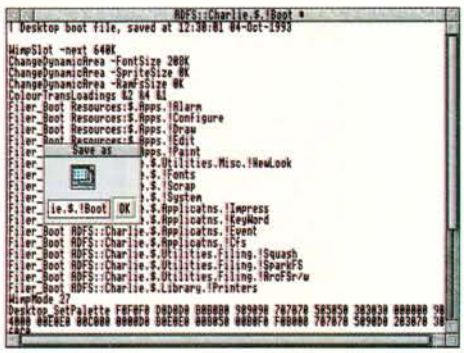
● *Just drag the program you want on the pinboard to the position you like and let go*

● *The Acorn at the right of the icon bar holds the desktop boot save options*



● *When you're happy with the start up screen drag !Boot to the top level of your hard disk*

● *First thing first. Let's get rid of that window which is open when I start up*



● *Do remember to save your changes each time by pressing F3*

● *You want to add a clock to the iconbar. Load your Desktop boot file – Shift+double-click*

➤
the iconbar. In addition, some programs, for instance Twilight, run a file within the application rather than booting or running themselves so they look a bit unusual.

Pinboard shows what programs you have on the pinboard as well as their locations. For example !Printers is at coordinates 1040 246, while Impression isn't on the backdrop so has no such number after it.

If an application is on the Pinboard you can remove its Filer_Boot line because Pinboard also does a boot on it.

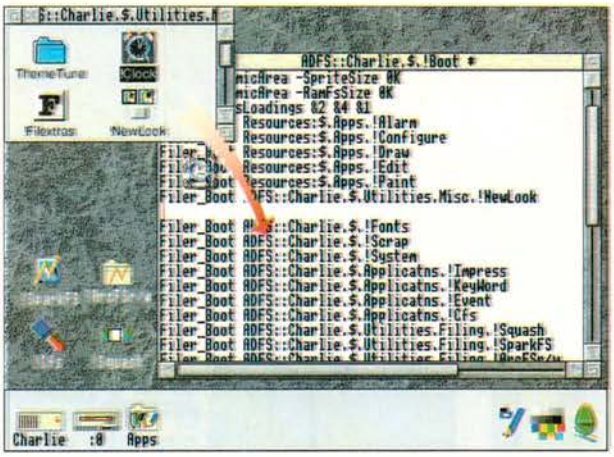
If you want to edit your Desktop Boot file in future you can go through the whole procedure again. But there is a shortcut.

Let's say you want to add a clock to the iconbar. Load your Desktop boot file – Shift+double-click – and place the caret at the beginning of a blank line. Find the clock you want to add. Holding down Shift, drag the program icon into the Edit window and drop it. You'll see that the full pathname of the file is put into the boot file.

You can remove the space by pressing Delete or Copy but it you leave it it won't interfere with the program.

Finally add *Filer_Run* or *Filer_Boot* at the beginning of the line to run/load the program.

Don't forget to save your changes by pressing F3.

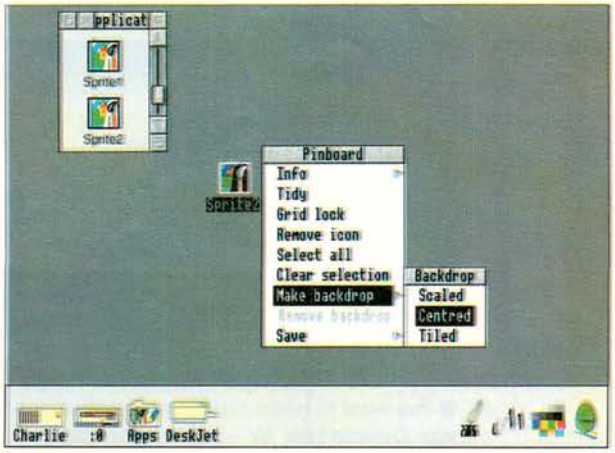


● *You can add programs to the !Boot file by holding down Shift and dragging in the program icon*

```
| Desktop boot file, saved at 12:30:01 04-Dec-1993

WimpSlot -next 640K
ChangeDynamicArea -FontSize 208K
ChangeDynamicArea -SpriteSize 0K
ChangeDynamicArea -RamFsSize 0K
ColourTransLoadings &2 &4 &1
Filer_Boot Resources:$.Apps.!Alarm
Filer_Boot Resources:$.Apps.!Configure
Filer_Boot Resources:$.Apps.!Draw
Filer_Boot Resources:$.Apps.!Edit
Filer_Boot Resources:$.Apps.!Paint
Filer_Boot ADFS::Charlie.$.Utilities.Misc.!NewLook
Filer_Boot ADFS::Charlie.$.!Fonts
Filer_Boot ADFS::Charlie.$.!Scrap
Filer_Boot ADFS::Charlie.$.!System
Filer_Boot ADFS::Charlie.$.Applicatns.!Impress
Filer_Boot ADFS::Charlie.$.Applicatns.!KeyWord
Filer_Boot ADFS::Charlie.$.Applicatns.!Event
Filer_Boot ADFS::Charlie.$.Applicatns.!Cfs
Filer_Boot ADFS::Charlie.$.Utilities.Filing.!Squash
Filer_Boot ADFS::Charlie.$.Utilities.Filing.!SparkFS
Filer_Boot ADFS::Charlie.$.Utilities.Filing.!ArcFSr/w
Filer_Boot ADFS::Charlie.$.Library.!Printers
WimpMode 27
Desktop_SetPalette F0F0F0 D0D0D0 B0B0B0 909090 707070 505050 303030 000000 904000
00E0E0 00C000 0000D0 B0E0E0 008050 00B0F0 F0B000 707070 5090D0 203070 3060C0
Pinboard
Backdrop  -T ADFS::Charlie.$.Utilities.Misc.!NewLook.T7
Pin ADFS::Charlie.$.Applicatns.!Cfs 0-32 276
Pin ADFS::Charlie.$.Utilities.Filing.!Squash 136 288
Pin ADFS::Charlie.$.Utilities.Filing.!SparkFS 0-26 416
Pin ADFS::Charlie.$.Utilities.Filing.!ArcFSr/w 148 432
Pin ADFS::Charlie.$.Games 48 916
Pin ADFS::Charlie.$.Applicatns.!Event 1026 536
Pin ADFS::Charlie.$.Applicatns.!KeyWord 1024 384
Pin ADFS::Charlie.$.Library.!Printers 1040 246
Run ADFS::Charlie.$.Applicatns.!Impress
```

● *You can edit the !Boot file in Edit as normal*



● *You can use Pinboard to display your favourite picture. Just drag the file on to the backdrop and click menu over it*

● *This is the centered option but beware – sprites like this can take up a great deal of memory*

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KEY:

(Gr)aphics	(Sp)readsheet
(Ga)me	(Da)tabase
(Ed)ucational	(In)tegrated
(Mi)scellaneous	Package
(Wo)rdprocessor	(La)nguage

HOW TO ORDER

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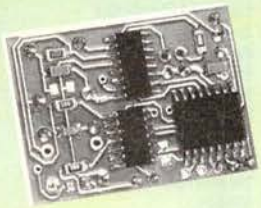
Acorn Multimedia

- Multimedia Expansion £485
- Multimedia Expansion + 16 bit SCSI £585

VIDC Enhancer



Our two unique VIDC add-on boards for the Archimedes cater for all VGA and Multiscan monitors and screen modes. The multimode software supplied, provides all the new modes for the selected monitor type, including the now standard Computer Concepts modes. With VGA monitor, you are no longer restricted to a few modes. A Desk Top application supplied on disc, allows new modes to be designed and existing modes to be modified for particular monitors.

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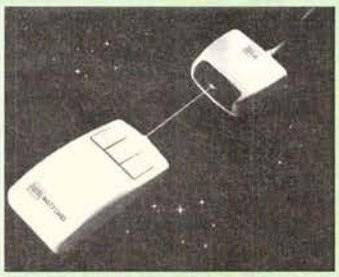

Features
- Infra Red Signal Transmission
- High Resolution 200 DPI
- High Tracking Speed of 600mm/s up
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- Low Friction Teflon Footpads
- Power - by two AAA size batteries (not included)
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Price £26

Archi A4 Scanner

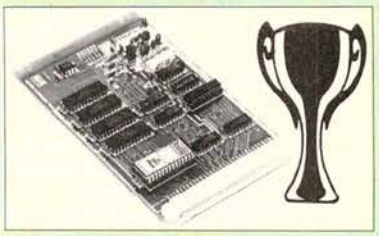
The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures.
Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400 dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.
Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.

Archi A4 Scanner	£199
Sheet Feeder for above	£75
Scanner + Sheet Feeder	£269

Spares for Archimedes

Archi Keyboard	£29	Cased Keyboard	£120
Controller VIDC	£39	A3000 Keyboard	£45
I/O Controller	£39	ARM 2 CPU	£39
A400 Floppy Drive	£59	Fan Filter	£6
A3000 Floppy Drive	£59	Keystrip	£5
A300/400 PSU	£89	MEMC	£29
A3000 PSU	£49		

Archi Real-Time Digitiser



Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £75

A Set of Colour Filters for colour image grabbing using a video camera **£16**

Archi to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
- Risc OS 2 Version **£15** • Risc OS 3 Version **£16**

(P.S. For A3000 Serial Upgrade **(£19)** required)

A3000 Accessories

• 3.5" External Drive	£95	• Monitor Stand	£15
• Technical Manual	£32	• Serial Upgrade	£19
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A3000 I/O Card (User, Analogue & IIC)

This NEW versatile I/O Card from Watford, fits inside the A3000 and includes an Analog to Digital Converter, a User Port, and an InterIC (IIC) connector.

The card allows many of the peripherals developed for the BBC to be used with the Archimedes A3000. The ADC and User Port have the same pin out and connectors as the BBC computers.

Extensive RISC OS software is supplied to provide BBC OSBYTE calls for support of the ADC and User Ports, including the BASIC keyword ADVAL. The software provides extended RISC OS support for separate interrupts from both the ADC and User Ports, permitting easy interrupt driven operation.

The card is provided with all the software in ROM and is automatically loaded when the machine is turned on.

Peripherals connected to the ports can obtain up to 500mA of power at +5V. A fuse is fitted to the card to protect the A3000 from damage arising from accidental short circuit of the power output.

Features
- An 8 bit User Port with a standard 20 way IDC connector, compatible with the User Port on the BBC computers and the Archimedes I/O Podule.
- A 10 bit Analog to Digital Converter with a standard 15 way D type connector, compatible with the ADC on the BBC range of computers and the Archimedes I/O podule.
- An InterIC (IIC) Port with a 5 pin DIN socket to connect the A3000 to external IIC devices. **£38**

Cortian CKAI Interface

Eliminates need to have a User port in A3000/305/310/400/540 when using Concept Keyboard. **£28**

Concept Keyboards

• A4 Standard Pack	£89	Primary Pack	£95
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Now everyone can afford an Archimedes Micro, monitor, printer, Hard Drives etc., with Watford Electronics 12, 24 & 36 months credit facility.

Please telephone 0582 74 55 55 for details.

Archimedes External Disc Drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead.
Price £21

Back Plate Extension
- A300/400 **£15;** • A3000 **£14**

ARM 3 Turbo Card MkII

Simply The Best

Here it is at last – the all new Mark 2 version of Watford's highly acclaimed ARM 3 processor board for the Archimedes and now also the A3000 series computers. Using the latest surface mount technology on a high quality four layer circuit board we have reduced the overall size to a mere 53mm x 45mm, and the cost to only £145. Mk II upgrade will increase the speed of your micro by a factor of 3 to 6.
Any competent A300 or A400/1 series micro owner can fit the upgrade himself, as we provide full fitting instructions and a special ARM chip extraction tool. However for A3000 micros and those not wishing to perform the upgrade themselves, we will collect, upgrade and return your micro by courier service, at an additional cost of £24.
(A300 and old A440 series owners please note – you will need to upgrade to MEMC1A for ARM3 to work.)

RRP £249

Special Offer £119

Network Accessories/Software

BBC B Econet Kit	£42
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(P.S. Full range of Network Accessories/Software/ Site Licences available. Telephone for details.)

Leasing finance at very attractive rates now available to Businesses (subject to status), Schools, Colleges, Universities, Government Depts. and Local Councils.

Continued→ → → → → → → → →

Archi Mk II Hand Scanner

Watford's Mk II hand scanner has a maximum resolution of 400 dpi. The scanning width is 4". The sophisticated software is supplied in a 64K ROM, located on a standard single width expansion podule. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. Other facilities include Cropping and scaling to any size including stretching and squashing in X and Y directions separately. Colour tinting. X and Y flip. Edge detection which turns solid objects into outlines. Images can be printed on any printer supported by RISC OS.
On-screen help is provided via the RiscOS interactive help facility. (Please write in for full technical details).

AHS-4 Archi 300/400 Version £89
AHS-3 Archi A3000 Version £99

Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.

QT-10 BBC/Master Version £25
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When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

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Lifetime warranty on 3M Discs

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Top Quality Diskettes

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- *10 x **M5** 5.25" D/S D/D 40 Track* £5
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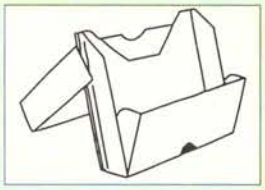

DLC1 – Holds 5 x 3.5" Discs. £1.50
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Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1772 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1772 DFS, plus many more added features.

- Complete Kit Special Price £39
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Beebmon	£22
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GXR-B	£21
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Numerator – BBC	£39
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Price includes a FREE Wordaid Rom

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Solderless Rom Board	£32
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- **CubScan 1440** – 14" £389
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Panasonic monitors carry 2 years on-site maintenance warranty

Aries AlphaScan Monitor

Its multiscan circuitry provides automatic adjustment for frequencies between 31 and 56KHz horizontal, and 43 and 70Hz vertical. Its 0.28mm dot pitch high resolution tube provides super sharp text graphics, while a high speed (70/72Hz) refresh rate provides a flicker-free display easing the eye strain. The VIDC Adaptor supplied with the monitor allows high resolution operation in all screen modes. £299

- Aries Alphascan 17 Plus – 17" £585
- Aries 6000 – 15" Flat Screen, 0.28mm non-glare 1024 x 768 non-interlaced (70Hz) Microprocessor controlled £395
- Aries 7000 – 17" Flat Screen, 0.28mm non-glare. Maximum resolution 1280 x 1024 non-interlaced. Microprocessor controlled £625

Philips Monitors

- **BM7502** 12" Hi-res Green £88
- **CM8833ii** 14" med. Res Colour. Ideal for BBC B; Master & Archimedes £192
- Dust Cover for Philips Monitors £6
- Spare Monitor Leads (various) £7

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Continued→ → → → → →

Pace External Modems

All Pace modems are BABT Approved and include a 5-Year Parts & Labour Warranty

Linnet Plus – Intelligent, V21/23 Auto Dial/Answer, Hayes Compatible **£89**

Linnet 24 – Intelligent, V21/V23, V22, V22bis, Auto Dial/Answer, Hayes Compatible **£135**

Linnet Quad – Intelligent, V21/23, V22, V22bis, V42, MNP 4&5, Auto, Dial/Answer, Hayes Compatible **£159**

Linnet 32 – V32, V22bis, V42bis, V42, MNP 4&5 **£239**

Linnet 32+ – V32bis, V32, V22bis, V22, V23, V21, V42bis, V42, MNP 4&5 **£285**

Ultralink Quad – V22bis, V22, V21, V23, V42bis, V42, MNP 4&5, Upgradable to Ultralink 32 Plus Spec. **£195**

Ultralink 32+ – Intelligent, V32bis, V32, V22bis, V22, V21, V23, V42, MNP 4&5, 2&4 wire leased line with P.S.T.N., dial backup and auto restore **£389**

Archi Comm. Software

- Hearsay 2 **£68**
- ArcComm 2 **£45**
- RS-232 Cable for above modems **£9**

Printer Leads

- BBC Centronics 4' **£5;** 6' **£6**
- Archi Parallel 2m **£5;** 5m **£9;** 10m **£13**
- PC Parallel 2m **£5;** 5m **£9;** 10m **£13**
- 25 pin D Male/Male 2m **£5;** 5m **£10**
- Centronics Double Ended 4' **£5;** 6' **£6** 5m **£10;** 10m **£14**
- RS232 Leads Various **£POA**

Integrex Ink Jet Printers

- Paper Roll for Integrex 132 **£6.50**
- BBC Screen Dump Software **£10**
- Colour Cartridge **£23**
- Black Cartridge **£14**
- 100 A4 OHP transparencies **£55**
- Colour Jet 2000 **£599**
- Betajet Ink Jet Printer **£185**
- Betajet Cut Sheet Feeder **£43**
- Integrex Colourjet Series 2 **£335**
- Auto Sheet Feeder for Series 2 **£45**

Star Printers

	Printer	CSF	Ribbon
LC15	£186	£135	£5
LC20	£102	£60	£4
LC100C	£117	£65	£9
LC24-15	£245	£135	£5
LC24-100	£140	£69	£5
LC24-20 Mk2	£175	£65	£5
LC24-200C	£205	£65	£12
LC200 C	£151	£65	£12
Star Jet SJ48	£169	£43	£16
SJ144C	£434	–	–
XB24-200C	£324#	£80	£12
XB24-250C	£389#	£139	£12
ZA-200C	£260#	£89	£12
ZA-250C	£324#	£139	£12

Includes 12 months on-site warranty

- Black Ribbons for Colour Printers **£5**
- Serial 8K I'face LC10/15/24/200 **£52**
- 32K Buffer LC/XB24-10; 15; 200 **£52**
- Star/Archi Colour Printer Driver **£15**

NEC Printers

	Printer	CSF	Ribbon
P22Q	£181	£59	£6
P32	£235	£59	£6
P62	£339	£79	£8
P72	£395	£115	£8
P90	£577	£115	£8

- Jetmate J400 **£169;** Jetmate J800 **£249**

- Black Ribbons P20; P32 **£6**
- Ribbons P60/70/P90 Black **£8;** Colr **£14**
- P60/70 Colour Option Kit **£59**
- CSF for P20 **£59;** P60 **£89;** P70 **£89**

Laser Printers

All Laser printers (excluding HP Lasers) include 12 Months On-Site maintenance

Brother HL4-PS Postscript	4ppm	£965
Brother HL6 – NEW –	6ppm	£427
Brother HL10-PS	10ppm	£1265
Brother HL10-DV	10ppm	£1016
Brother HL10-DPS	10ppm	£1435
Canon LBP4 LITE	4ppm	£478
Canon LBP4+ 1.5M RAM	4ppm	£639
Canon LBP-8 Plus IIIR	8ppm	£1420
Canon LBP-8 IV 600DPI	8ppm	£932
Epson EPL-4300	4ppm	£520
Epson EPL-5000	6ppm	£439
Epson EPL-5200 – NEW –	6ppm	£525
Epson EPL-7500 PS	6ppm	£1135
Fujitsu VM600	6ppm	£539
HP Laserjet 4 ML	4ppm	£757
HP Laserjet 4	8ppm	£1048
HP Laserjet 4L – NEW –	4ppm	£459
HP Laserjet 4M PS	8ppm	£1369
HP Laserjet 4si	16ppm	£2199
HP Laserjet 4Si MX 1200 DPI	16ppm	£3325
NEC Silentwriter S62P PS#	6ppm	£989
NEC Silentwriter S102	6ppm	£893
NEC Silentwriter2 290	8ppm	£1125
NEC Silentwriter 290P PS	8ppm	£1449
OKI OL400E	4ppm	£399
OKI OL410		£589
Panasonic KX-P4410	5ppm*	£445
Panasonic KX-P4430	5ppm*	£579
Panasonic KX-P4451 DB	11ppm*	£839
Panasonic KX-P4455 PS	11ppm*	£1249
Star LP-4 Post Script	4ppm	£759
Star LS-5	5ppm	£449
Star LS-5 EX (RISC Based)	5ppm	£548
Star LS-5 TT True Type+Mac	5ppm	£739
Star LP-8 III postscript	8ppm	£1125

*2 years on-site warranty

FREE Logitech Scanman 32 scanner & Microsoft Publisher

- HP Laserjet 4L 3 years on-site **£100**
- HP Laserjet 4si 3 years on-site **£505**
- HP Laserjet 4/4M 3 years on-site **£170**

Laser Toners

Canon 2, 3 & 4	£52	KXP4450/50i/55	£19
Canon LBP8-IV	£75	KX-P4420/30	£25
Canon 8/Star LP8	£59	NEC SWriter	£84
Epson GQ	£12	HPII/D, III/D	£58
EPL 40/41/4300	£55	HP IIP, IIIP	£48
EPL 71/7500	£117	HP4/4M	£72
EPL 8100	£117	HP Laserjet 4L	£55
EPL5000/VM600	£89	OKI OL400/800	£18
Qume Crystal(3)	£84	OKI OL400e	£17
Star LP4	£52	VM800 8K pages	£109
Star LS5	£69		

Laser RAM Upgrades

Type	1M	2M	4M	
IIP; IIIP	£49	£80	£132	
II & IID	£60	£96	£142	
LJ4/4M	£69	£75	£159	8M/£279
EPL4100	–	£120	–	512K/£52
KX4420/50i	£59	£89	£149	
NEC S62/S102	£99	£180	–	
Star LBP	£139	£275	–	
Laserjet 4L	£75	–	–	

Jetpage Postscript Cartridge

- HP IIP/IIIP **£225** IID & III **£227**

Various Add-Ons

- Laserjet Appletalk Interface **£135**
- HP Adobe Postscript+ Cartridge **£359**
- Pacific Page Postscript **£259**
- HP Premier Font Collection **£28**
- Laserjet Various Font C'tridges **from £45**
- HP Postscript Module for LJ4 **£270**
- Laserjet 4 Powered envelope feeder **£199**
- Jetdirect Ethernet Card for Laserjet IIIsi/4/4Si **£359**
- 500 Sheet paper cassette (3rd Bin) **£205**
- HPIIP/IIIP Lower Cassette Tray **£115**
- Canon LBP-4 Lower Cassette Tray **£96**
- Ozone Filter P4420 **£9;** P4450/55 **£20**

Panasonic Printers

	Printer	CSF	Ribbon
KX-P1123	£124	£49	£7
KX-P1170	£98	£59	£6
KX-P1624	£264	£126	£8
KX-P1695	£267	£126	£6
KX-P2123M	£144	£69	£7
KX-P2124	£215	£89	£7
KX-P2180M	£126	£69	£7
KX-P2624	£272#	£126	£8
KX-P2023	£158	£155	£8

FREE – Printer lead with every Panasonic printer listed above

Includes 12 months on-site warranty

- Dustcover for 80 column printers **£6**
- Serial Interface for above Printers **£46**
- Black Ribbons for P1081, 1180, 1124 **£7**
- Brown, Blue or Red Ribbons for KX-P1081/1592/1595/1695 **£9 each**
- 32K Buffer for above Printers **£16**

Colour Kit for KX-P2180; KX-P2123 and KX-P2124 **£37**

Citizen Printers

120D+	£94	Swift 200	£178
PN-48	£179	Swift 240	£200
Swift 90	£132	Swift 240C	£212
Swift 90C	£198		

2 years parts and labour warranty on all above Citizen Printers.

- Swift 24 Ribbons: Black **£4** Colour **£13**
- Cut Sheet Feeder for 80 col. printers **£75**
- Citizen 120D Ribbons **£3.50**
- Archi Colour Printer Driver **£15**

Hewlett-Packard Printers

DJ500 colour	£239	DJ Portable	£185
Desk Jet 510	£199	Quiet Jet plus	£299
DJ 550 Colour	£399	Desk Jet 1200C	£1040

+ Includes 12 months on-site warranty

3 years on-site maintenance available as follows:

DeskJet & DeskWriter mono	£55
DeskJet & DeskWriter colour	£65

- Paintjet Cartridge Black **£17;** Colour **£27**
- DJ Portable CSF **£49;** Carrying Case **£49**

Hi-quality InkJet Paper
A4 90gsm 500 sheets £9

Desk Jet 500 Accessories

- Ink Cartridges Black **£16;** Colour **£23**
- High Capacity Ink Cartridges Black **£25**
- Ink Refill Double Pack (JetFill) **£10**
- Ink Refill High Capacity (JetFill) **£16**
- Deskjet Turbo Driver **£45** **(only £39 when purchased with printer)**
- Archi – DJ550 Colour Printer Driver **£14**
- Epson FX Emulation Cart.(500 mono) **£45**
- IBM Proprinter Emulation Cartridge **£59**
- Wordperfect Cartridge **£89**
- DJ 500 Dust Covers **£6**
- 636G 50 x Transparencies A4 **£40**
- 636J 50 x Glossy Paper A4 (also XL) **£40**
- 630Z 50 x Cut Sheet Paper A4 **£15**

Plug In Font Cartridges for DJ 500

22706B - Prestige, Elite, Line Draw **£55**
22706C - Letter Gothic & HP Line Draw **£56**
22707P - Proprint Emulation Cartridges **£57**

HP Paintjet/XL Accessories

- 630P 200 Z-Fold paper 8.5 x 11 **£14**
- 630Q 50 Transparencies 8.5 x 11 **£39**
- 630S 50 Transparencies A4 **£40**
- 630Y 200 Cut Sheets 8.5 x 11 **£14**
- 631Y 200 Cut Sheets A4 **£18**

Epson Printers

	Printer	CSF	Ribbon
FX870	£265	£47	£4
FX1170	£335	£69	£6
LQ100	£122	£–	£4
LQ570+	£204	£39	£4
LQ870	£359	£39	£6
LQ1060	£585	£155	£6
LQ1070	£310	£69	£6
LQ1170	£445	£69	£6
LQ2550	£669	£360	£6
LX100	£115	£–	£4
LX400	£92	£69	£4
LX850+	£135	£69	£4
LX1050	£204	£125	£6
SQ870	£419	£170	£23
SQ1170	£560	£155	£23
SQ2550	£669	£–	£23
Stylus 800	£199	£–	£10
Stylus 1000	£355	£–	£10

Epson RS232 Interface

Standard **£28;** +8K Buffer **£75**

- LQ100 Tractor Feed **£29**
- FX850/LQ800/850 Tractor Feed **£69**
- FX/LQ1050 Tractor Feed **£85**
- LQ2500/2550 Tractor Feed **£90**
- Dustcovers for 80 col printers **£6**
- Stylus 800 Transparencies (50) **£35**

Canon Bubblejet Printers

	Printer	CSF	2nd Bin	Ink Cart
BJ10SX	£165	£43	–	£16
BJ200	£244	–	–	£16
BJ230	£280	–	–	£16
BJ300*	£305	£88	£88	£12
BJ330*	£369	£92	£79	£12
BJC800C	£1219	–	–	£16

- BJ10E/10EX/10SX/200/230 Jumbo Ink Refill pack (Jetfill Twin Pack) **£12**
- Optional Battery pack for BJ10EX/SX **£33**

* includes 12 months on site warranty

Fujitsu Printers

B100 Inkjet	£159
B200 Inkjet	£215
Ink Cartridge for B100/200	£14
Ink Refill for B100/200	£10

Professional Printer Stand

The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £16
132 Column version £25

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Universal Printer Sharers

Connect up to 4 Micros to 1 printer or 4 Printers to 1 Micro with our combined, Sharer/Changer switch boxes.

Standard Low Cost Sharers

Connects	Serial	Parallel
2 to 1	£8	£9
3 to 1	£11	£12
4 to 1	£15	£16

Professional Sharer Units

Connects	Serial	Parallel
2 to 1	£12	£13
3 to 1	£15	£17
4 to 1	£24	£26

Auto Printer Sharer Switch

Connects	Serial	Centronics
• 2 to 1	£27	£29
• 4 to 1	£44	£45
• 8 to 1	–	£75

256K Multi Spooler

These Parallel Auto printer sharer switches have built-in 256K Buffer.

• 2 In / 2 out **£99** • 4 In / 2 out **£115**
• 8 In / 1 out **£149**

(Cables for all printer switches are from £5 each please specify the type required when ordering.)

Compact Converter Unit

Serial to Parallel & Parallel to Serial **£32**

Listing Paper

- 1,000 Sheets 9.5" x 11" Fanfold **£7**
- 2,000 Sheets 9.5" x 11" Fanfold **£11**
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold **£21**
- 1,000 Sheets 15" x 11" Fanfold **£9**
- 2,000 Sheets 15" x 11" Fanfold **£16**
- 1,000 Sheets true A4 Fanfold Paper 70gms **£11**
- 2,000 Sheets true A4 Fanfold Paper 70gms **£21**
- 500 Sheets A4 80gms Bond **£3.50**
- 500 Sheets A4 90gms Cartridge for Ink Jet/Laser printers **£9**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Cross Over Manual Switch

2 In/2 Out Parallel	£29
2 In/2 Out Serial	£28
3 In/2 Out Serial	£36

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
BBC B/BBC Master	–	£6.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.25	£6.00
EX800/1000	£6.00	£6.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£6.00	£6.00
LQ400/500/550/800/850	£5.50	£6.00
LQ1050/LQ2500	£12.00	£6.00
LX400/800/850	£3.50	£6.00
M1009/GLP	£2.95	£6.00
NEC P2200	£4.50	£6.00

Dust covers for most 80 column printers available at £6 each

Printer Labels

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£4.50
1,000 90 x 36mm (Twin Row)	£4.60
1,000 90 x 49mm (Twin Row)	£4.95
1,000 102 x 36mm (Twin Row)	£4.70

Laser Printer Labels on A4 Sheets

3750 – 70 x 29mm (3 Rows x 10)	£15.50
2400 – 70 x 37mm (3 Rows x 8)	£15.25

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- Psion 3a 256K **£189**
- Psion 3a 512K **£225**

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• 128K **£48** • 512K **£97** • 1Mb **£199**

Flash Solid State Disc (SSD)

• 128K **£30** • 556K **£48** • 512K **£79**
• 1Mb **£139** • 2Mb **£199**

Communications

- Parallel Interface Link **£25**
- RS 232 Serial Link for PC **£58**
- RS 232 Serial Link for Mac **£59**

Various

- Mains Adaptor 9V AC **£12**
- Spreadsheet **£59**
- Professional Finance **£42**
- Spelling Checker/Thesaurus **£42**
- Desk Stand **£15**

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- Connects directly to BBC Analogue port
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- Switchable springs allow selection of floating or centring operation.
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Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage translent spikes/surges caused by lightning or thermostats switching.

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Beeb DOS

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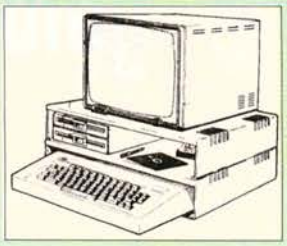
Plinths for the BBC Master and A3000



- Single 490 x 310 x 105mm **£14**
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- A3000 Single Plinth (very sturdy & precision made), has a slot on the left for the switch & cut out on the right for 3.5" Disc Drive **£15**

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Our handy little splitter unit eliminates the risk of damaging your micro due to constant plugging and unplugging of the mouse by allowing you to connect both, a joystick and a mouse simultaneously to your Archimedes. **£10**

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BBC Master Keyboard	£62
BBC Master Casing	£49
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BBC B Casing	£13
Clear Perspex Keystrip Holder	£3
BBC B Keyboard	£35
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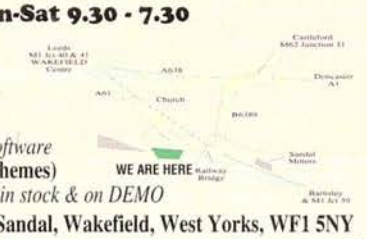

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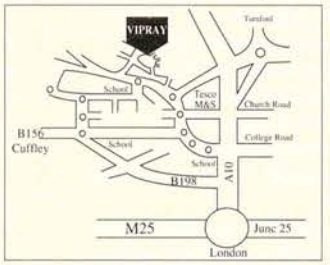

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Get animated!

Mike Goldberg explores the art of movement and drama

THE other day I found myself playing a rather savage *beat-'em-up* – no names but it was a combat game involving mortals – and I was thinking how ridiculous some of the animated sequences were: "How can anyone leap *that* high? Look at that – that punch has knocked that bloke 10 foot up in the air! Silly," I thought.

But my thinking lacked a certain conviction and then I realised why. Games, even simulations, fall into the category of make-believe and especially those utilising cartoon-like ingredients.

And if it's one thing that cartoons are not renowned for it's understatement. If you're going to represent landing a devastating death-punch on someone it's no good if your opponent just keels over or starts crying.

When he's hit you have to over-emphasise the action to impart weight and force to the animation, to lend it convincing realism. Otherwise it will go unnoticed.

As modern computer ram size no longer restricts the graphical content of a game, programmers now find themselves having to include animation they would previously have left to the user's imagination – because it's expected now that if you have a machine capable of running a 1Mb+ game every single one should be at least that size.

What usually happens is that a short and boring game can now expand into a very long and boring game. Size isn't everything, but *quality* is, which is why the best current offerings rely, not just on gameplay, but on a combination of proven graphical elements plus on-going innovations, the latest being 360 degree background rotation and morphing, for example.

Understanding how to place these elements in a game then, is crucial to the final outcome. That, coupled with timing and relevance, all help to make at least the graphics enjoyable in a game.

To demonstrate some of the techniques you will need, I have created a piece of animation called *GameFX!* which demonstrates how to animate simultaneous events, using some good – and some awful – animation.

Yes, how NOT to do something can be just as illuminating as how to do it properly, and if you think that's an excuse for getting it wrong you're absolutely right.

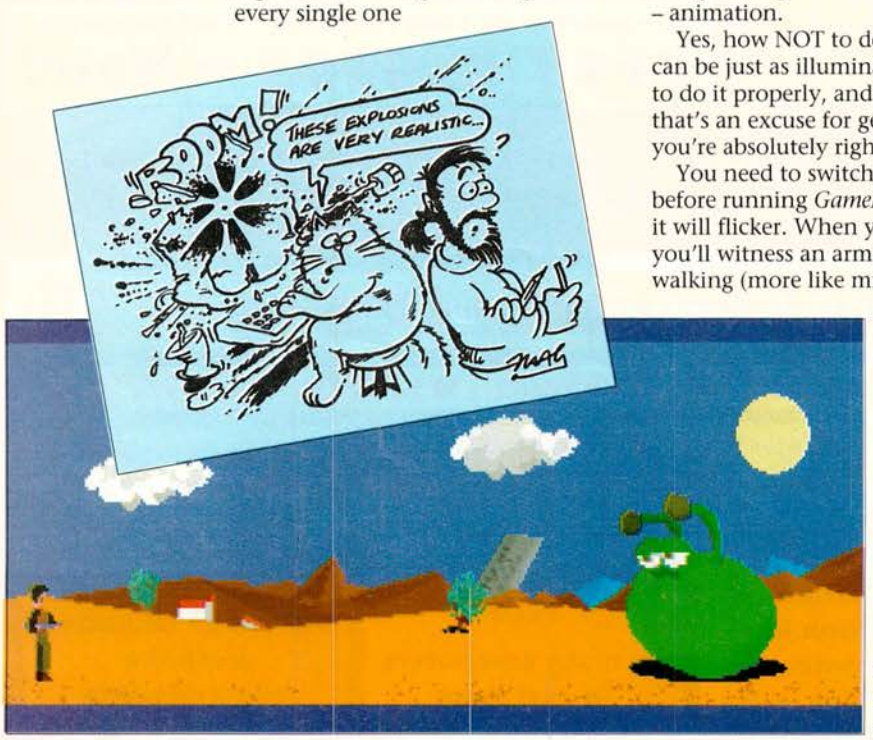
You need to switch to Mode 15 before running *GameFX!*, otherwise it will flicker. When you run it you'll witness an armed man walking (more like mincing) across the screen firing his weapon at an amorphous blob – Figure I.

One of the most difficult things to emulate is the walking action of a human being. Everyone walks slightly differently, which is why you can identify someone you know from a long way off – there's a distinctive telltale signature to the gait.

Obviously the legs have to bend as you move, but as your weight shifts on to the leg that's stepping forward you can help suggest this by lowering the height of the upper half of the body.

I used seven sprites to represent the inbetween movements of the legs and lowered the height of two of them. By repeatedly running through this sequence and making sure the lateral (X shift) movement matched the actual pace length of the man, I almost came up with some decent animation.

I say almost because the result looks more like someone trying to skip with six stone of potatoes in each trouser pocket. More work needed on that bit, I think.



● *Figure I: Setting the scene*

Adding action

Anyway, every now and again our limping hero takes a pot-shot at Blobby with his latter day Johnny 7 (if you don't know what that is you've had a sheltered upbringing or you're under 30). Instead of just firing a missile our man kneels down to steady himself and a jet of fire is emitted from the end of his gun.

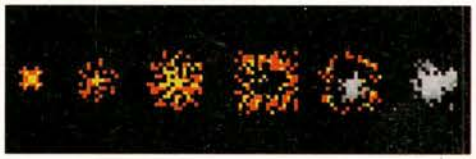
The kneeling emphasises the change in action and the fire helps locate the source of the missile and its explosive power. When the missile strikes Blobby the force of the impact is reinforced by moving Blobby back a bit and giving him a suitably angry expression, then placing him back where he was.

The missile explodes in a sequence of five frames (Figure II) at the point

● *Figure III: This looks like it's gonna hurt*

of contact. As in reality, the explosion begins at the centre and travels outwards leaving a residue of black cloud.This is where timing is critical.

All of the elements displayed are controlled from one main loop initially – from it all parts of the display are examined to see if they need updating or removing. The sequence of frames for the explosion is separated in time by an incrementing variable counter *hc%* (hit counter) which will show the same frame for N loops of the main loop:



● *Figure II: The explosion sequence in detail*

```
                        DEFPROChit
hc%+=1 : IF hc% = 2 hc% = 0: wh% = (wh%+1) MOD 6
  |          |                  |              |
hit counter  reset hit counter  which hit      increment sprite
               to zero when 2   sprite to      number to next
                                  print         frame when hit
                                                counter hc% = 2
```

This ensures that the explosion is not missed by changing the frames too quickly, that is, move to the next frame after only one loop. Have too many loops of the same frame and the animation is too slow and stilted. This is how everything is timed, each element having its own counter forcing a delay between the separate frames.

One of the oldest enduring elements of any game is an incrementing score received for killing baddies, collecting fruits and the like. So when the explosion is over a drifting score of 5000 smoothly wafts into the air from where the strike took place. This confirms the hit, displays the points scored long enough for even the busiest of game players to discern, and keeps everything rolling along instead of mere static acknowledgement. I wonder who first thought up that one?

After repeated firings and a walk out of the screen our man wraps around to re-emerge on the left for more of the same – except that he's in for a bit of a surprise. Blobby's tired of the battering he's taken and exacts a devastating revenge – look at the size of that missile, Figure III.

Yes, the shapeless one opens a cavernous maw to reveal a monster weapon which fires, with the necessary recoil, a size 10 bullet which hurtles towards our hero who fails to notice something the size of a fridge about to inflict irreparable damage to his credentials.

Overstatement again, but you're not supposed to miss what's going on. Predictably the man is hit and dies in a fashion normally only witnessed on computers and in old sci-fi films.

After a spate of the now *de rigeur* flickering associated with a terminal blow, comes the falling over sequence. With just three sprites I have displayed the initial hit (man is printed further back from where he stood and leans back at 45 degrees) then tilted further over and finally flat on his back. Unlike some combats with mortals I have left out the gore – realism's something else...

After this, our resident alien takes evident delight in the proceedings by simply interchanging two similar sprites, one more squashed than the other. It's how you would expect the locomotion of a blob to be after all. Still, it's inclusions like this that can add atmosphere to a game. And what *is* that cloud doing?

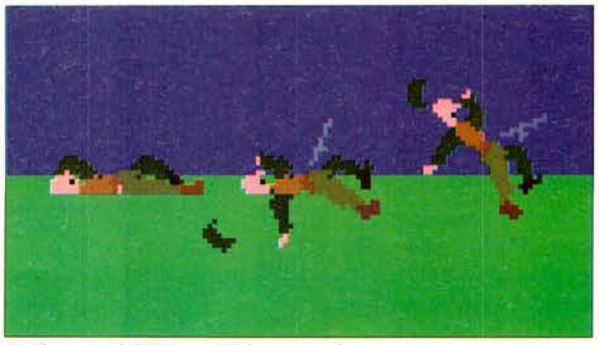
Finally, a token allusion to parallax scrolling which is only moving various sprites at faster speeds the nearer they are to you – despite the hype – and the last curtain call just to conclude the cartoon.

When all's said and done, good graphics can help imbue the lousiest game with some appeal, but can never rescue it completely. Conversely, a good game with lousy graphics is always worth playing.

But with ever increasing standards and larger memory we all have to try a bit harder with our graphics – it's no longer good enough to have BBC Micro block-like sprites.

● *Just take a look at the SICK version of Tetris or Petrov's Colour Tetris to see what can be done with* those *blocky graphics.*

```
                    DEFPROCyouDIE
                  state% = RND(7)+7
                        |
SYS O$, &222, area%, man%(RND(6)-1), X%, Y%, state%
  |                                          |
Make use of those 7                  The man is normally printed
sprites used to make                  with a mask so the number
the man walk by                       is 8. Now state% is made to
randomly printing them                equal any number between 8
on the same spot.                     and 15 so the man is
                                        sometimes ANDed
                                      or EORed or ORed etc to
                                        the screen.
```



● *The art of dying sensibly ... aargh ... got me.*

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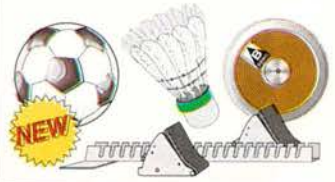

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Podule power

Mike Cook delves into his postbag to come up with solutions to your questions

AGENDA

- A/D conversion
- Old manuals
- Electronics motto
- Faulty chip or socket
- Adding devices
- Bare hard disks

Q IS IT possible to double up the single external port on the A3000? I am sure that I read somewhere that it is possible to buy a board with a plug on one side which connects to the podule plug and on the other side two sockets like the normal podule socket.

I know that Pineapple sell an internal card which gives a second podule slot, but I have already got an internal I/O podule fitted. I want to fit an IDE hard disk and the interface requires the external podule slot. I also want to use a scanner.

Can I obtain such a device as the doubler for the external podule socket? – **James Pankhurst, Corfe, Somerset**

A *As you want more than one extra device on your external slot I think your best option might be to look at the Expandable Multi User (EMU) interface from Cumana. This will allow you to add several expansion units to your A3000 and also works for A3010/3020 and A4000 as well.*

You will probably not be able to use your I/O podule, but all is not lost as this unit comes with a User Port as standard. Other alternatives are the A3000 drives with user port from RISC Developments or the Micro Podule system from HCCS.

Read all about it

Q I HAVE recently acquired a BBC Master for my daughter but have not got a User Manual. Can you tell me where I can obtain one and how much it will cost? – **T. H. Theakston, Cherry Willingham, Lincoln**

A *It is very difficult to get a manual for a computer which is no longer being manufactured. The best I could come up with is some original BBC Model B manuals which Watford Electronics still sell for £15. However, the Master had some new features not covered here.*

The alternative is to try Acorn directly on 0223 254254, then be ready to argue that you ***know*** *the machine is discontinued and all you want is the manual.*

Wiggle it

Q WITH regard to the letter from J. McLaughlin in the October issue I too removed the clip and plate holding the 6502 processor, wiggled the chip about and then reclipped. It worked on my Electron. – **Paul Leech, Seascale, Cumbria**

A *Thanks for the tip. My motto in electronics over the last 20 years has been* ***if it doesn't work waggle the wires.***

Lacking connections

Q I HAVE a BBC Master 128 and have just bought an analogue joystick. Unfortunately, on all the programs I have only the fire button seems to have any effect. A friend tried the joystick on his machine and it worked perfectly.

I have a light pen which plugs into the same port and doesn't work either. However, I have previously thought that this was because it was made for the BBC B.

Now I suspect that one of the chips might be faulty, maybe the analogue to digital converter. However, I do not have any technical manuals so I would be pleased if you could let me know which chip is at fault. – **J. Breedon, Chesterfield, Derbyshire**

A *The joystick and light pen go to two different chips so I would think it unlikely that your problem is a faulty chip. However, the fire button goes to the system via the 6522, which you say works.*

The moving part of the joystick is handled by the digital to analogue converter 7002 and finally the light pen goes to the 6845. This last chip also handles the video circuit, so it is unlikely that this is at fault.

If a chip is suspect the 7002 is the one to go for – replacements are available from Watford Electronics. However, I would suspect the socket.

What can happen is that you can get small movements on the socket that can cause tracks to crack and break the connections.

What you need to do is measure the signals on the 7002. With the joystick connected you should see the voltage on pins 12 and 13 change as you move the joystick. If this does not happen you have a bad connection, if it does you probably have a faulty chip.

Second-hand drive

Q I HAVE an older style A5000 with a 40Mb hard drive which I recently replaced with a Maxtor 245Mb hard disk. My Conner 40Mb drive is now surplus to requirements, and I am looking to sell it to a company as a bare drive. Where should I try sell it and for what price? – **Darryl Mills, Sunderland, Tyne and Wear**

A *Unfortunately there is very little demand for second-hand drives with such a small capacity. I remember the first hard drive I had was a 5Mb one which seemed large at the time.*

The problem for most companies is that they would not use a second hand drive in their new products – and who could blame them? I have seen bare drives like yours selling for around £30 at computer fairs so I guess this is the going rate. Computers and ancillary equipment do lose their value very quickly.

You can write to Mike Cook c/o Acorn Computing, Europa House, Adlington Park, Macclesfield SK10 4NP.

He will answer any questions about difficulties you may be having with your machines, mainly those to do with hardware. If you want a personal reply ensure that you enclose an SAE with your letter.

Changing numbers

Q I'M VERY interested in the analogue/digital conversion you had in a previous issue. I have an A3010 and want to use it with Saloon Cars Deluxe.

I found the June 1991 issue and wondered if the Body Building article there will cover what I need and if it will work on my machine? – **Chris Warner, Stanground, Peterborough**

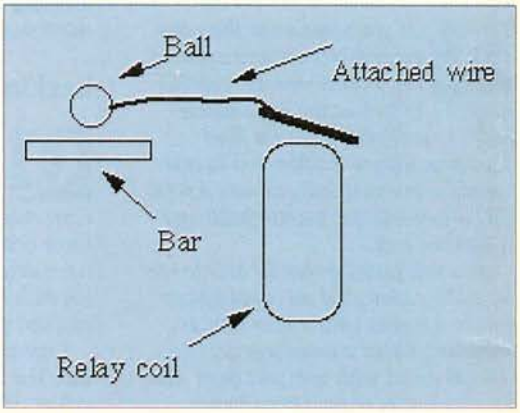
A *The article is the right one if you want to use it to sample sound. The software originally supplied did not support the newer bi-directional parallel printer ports, but an upgrade is available from Musbury Consultants,*

This also requires the serial signal be sent to the ACK pin and not the Busy pin. This is due to changes in how these pins operate in the new machine.

However, you can't connect this system up and expect a commercial game to know about it. All software has to know where to look first. It might be possible to write a joystick module for the sound sampler, but I have not done so. Has anyone?

Computer-controlled glockenspiel

Mike Cook enters into the Christmas spirit with a musical interlude



● *Figure I: A relay converted into a striker*

Now for something entirely different. For this Christmas special I thought we could have some fun and games before returning to the Computer Guided Telescope next month.

Each year as I look around the shops selling Christmas decorations I come across those musical bells designed for draping round your tree.

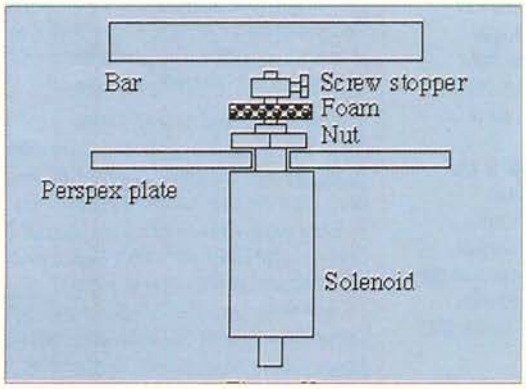
While initially they look delightful I am sure, as my wife keeps pointing out to me, they will drive you mad before long. This is probably due to the limited range of tunes available, so with scant regard for my sanity, which has been called into question on more than one occasion, I embarked on producing a computer-controlled version.

The idea was to take a child's toy xylophone and get the computer to play it. Now I know that the computer is capable of making noises electronically, but it is much more interesting to watch an instrument being played automatically. I am sure you have all seen crowds around fairground steam organs, whereas tapes of the same hardly sell at all.

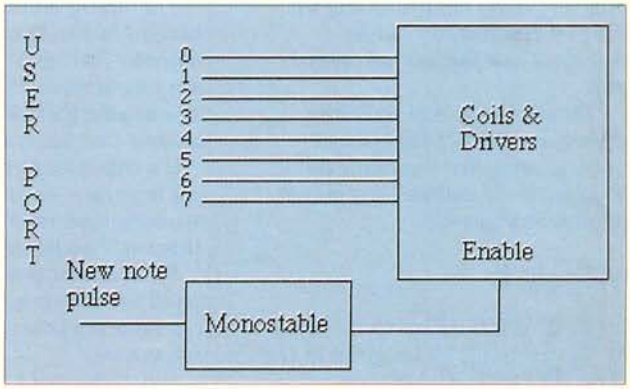
I found it impossible to find a toy xylophone but relatively easy to find a toy glockenspiel. A quick flip through the dictionary put me right – a xylophone is an instrument with wooden bars and a glockenspiel has metal ones. Therefore the shops were full of glockenspiels. Don't you just love the Trade Descriptions Act?

The one I have decided to use is from the Early Learning shops and seems superior to others. It has 8 notes, a good computer number, and each bar is electronically tuned.

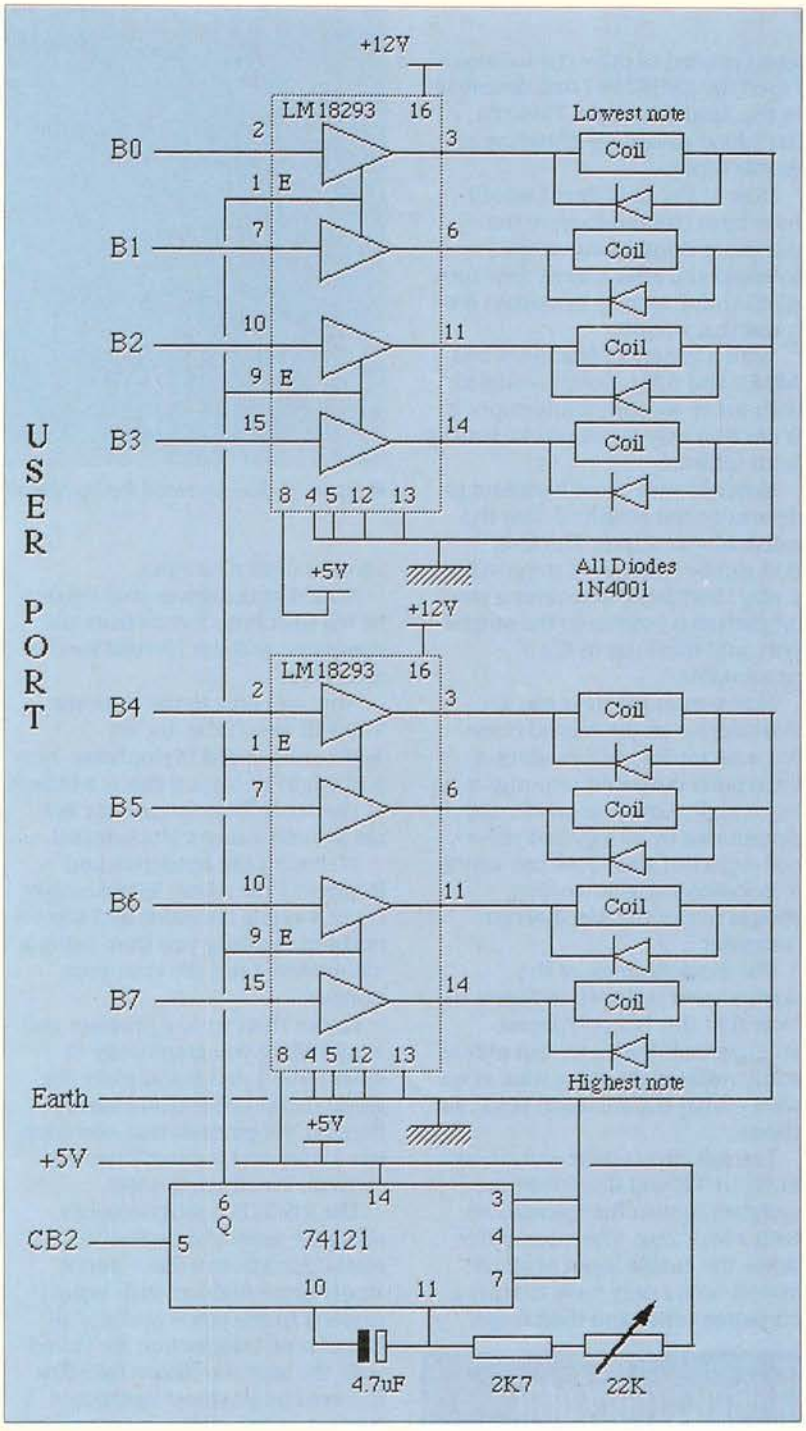
This process involves removing some metal from the back of the bar until it hits the right tone. The result is a tuned instrument with a



● *Figure II: Using a solenoid to strike the underside of the key*



● *Figure III: Block diagram of the Xylophone interface, polyphonic system*



● *Figure IV: Circuit diagram of the Xylophone interface*

pleasant tone – unlike some other toys available.

Now to decide how to strike the bars. The commercial bells use small clappers attached to a coil, rather like a relay. I considered using this approach at first – Figure I shows the basic idea.

You take a small relay and glue a thin but stiff wire on the moving part. To the end of the wire you attach a plastic striker and mount the whole thing on a frame.

Despite the low cost of this approach it did seem to be rather messy and involved a lot of mechanical work, so I thought again.

An electrical component designed to produce a striking movement is the solenoid, the problem is that they are quite expensive, especially when you consider how many we will need.

However, I found that they fitted particularly well on my glockenspiel. Underneath the instrument I fitted a Perspex plate and drilled holes under each bar to mount the solenoid.

Then I placed a small screw metal block, taken from a connection block, over the end of each solenoid plunger to stop it falling out.

I found this arrangement produced a bit of clatter when the solenoid was released, a problem solved by pushing a small amount of foam rubber under each stopper.

With the bars removed from the glockenspiel the solenoids did tend to stick in the up position, but once the bars were in place they prevented this from happening. In fact the glockenspiel and solenoids fitted so well together you would have though that they were designed to do just that.

Next I had to decide how to drive the solenoids from the computer. There are various ways of getting signals out of the computer, and any one of the many ways I have covered in the past will work here.

However, I decided to use a parallel user port so that any Acorn computer could be used. To convert the logic signals up to the 12 volt

➤

levels needed to drive the solenoids I used the LM18293 I first described in the April '91 article. These have the added advantage of having an enable input.

Now in the early days I would have been content to have the computer simply turn on the solenoid and after a short time turn it off. Unfortunately nowadays life is not that simple.

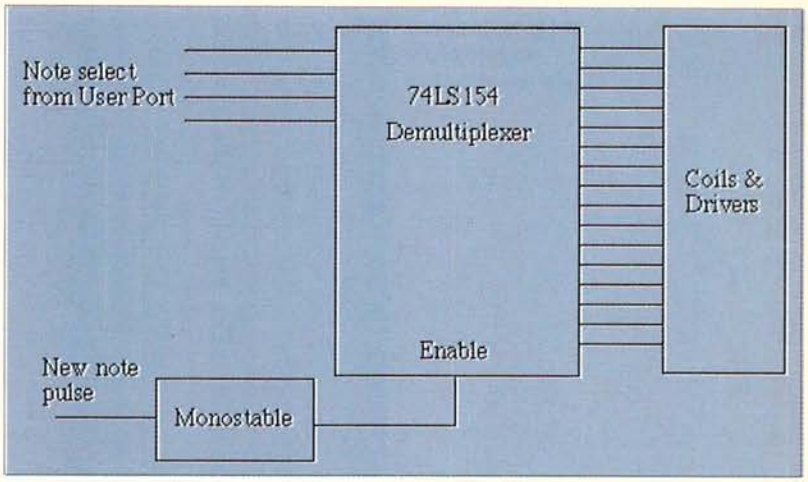
With a variety of machines and ARM 2 and ARM 3 chips, coupled with many sources of interrupts, it is not that easy to get precise timing from software.

Instead I used some hardware to determine the length of time the solenoid was driven. The User Port can be configured to provide a very short pulse whenever a new bit pattern is written to the output port, and this I use to fire a monostable.

Now a monostable is not a dwelling for an unmarried horse, but a circuit that will produce a fixed pulse output in response to an input logic edge. The pulse width is determined by an external resistor and capacitor and so we can adjust it to match our glockenspiel, irrespective of the speed of our computer.

The block diagram of the arrangement is shown in Figure III. Note that this is a polyphonic arrangement, that is we can play as many notes at the same time as we wish – what the technical boys call chords.

The full circuit diagram is shown in Figure IV, and the drivers are designed to turn the solenoid on with a logic one. The monostable drives the enable input of all the drivers, so we only have to write a bit pattern once and then forget about it until next time.



● *Figure V: How to extend the number of notes in a monophonic system*

Note that the driver chip needs to be fed with both 5 volts from the computer, and the 12 volts for the solenoids.

Now we come to the software. You will see on the disc an application called !Xylophone. Now you might well ask if this is a breach of the Trade Descriptions Act as I am actually using a glockenspiel.

Well with the restrictions on letters in a file name, !Glockenspiel is not a viable file name and there is nothing stopping you from using a xylophone. I rest my case, your honour.

Rather than write a program that would allow you graphically to enter notes I decided to make the glockenspiel driver read Maestro files, on the grounds that everyone has a copy and it already contains software for entering notes.

The RISC OS 3 programmer's reference manual describes the format for Maestro files – and it nearly gets it right as well. What it neglects to tell you is that the 16 bits of note information are stored with the least significant byte first followed by the most significant byte.

This had me puzzled for some time, as I was taking the current note with the timing of the next note. Due to the glockenspiel having only 8 notes any outside the range are interpreted as spaces.

Also Maestro files have up to 8 note queues where the timing of a note may be taken independently. My program only looks at the first note queue, if the other note queues are not blank a warning is given when the file is loaded. Only note frequency and timing are taken from the files, all the other information being ignored.

The menu from the bar icon allows you to control the tempo of the tune and also to make it repeat, or more importantly, stop. When a file is dragged on to the icon it will load and play; click select on the icon to get it to play again.

Finally there is an option which lets the glockenspiel play random music. Now if you just pick out notes at random it does not sound very good, so this uses the idea of brown noise or fractal music.

The next note is generated from the previous note by moving it a random distance away. This is repeated until a basic phrase has been generated consisting of a random number of notes.

This basic phrase is then added to the final tune in a number of different ways, again chosen at random. For example, we can transfer the phrase directly, or backwards.

We can move all the notes up one position or take the logic inverse of each note number. The result is that it sounds as if it will break into a good tune at any moment, but never quite manages it.

The restrictions of this circuit is, of course, its limitation to 8 notes. We can extend this to include sharps and flats at the expense of making it monophonic – that is only one note at a time. The block diagram of such an arrangement is shown in Figure V. You would need a glockenspiel with more notes or you could even use the string of Christmas tree bells your wife has decided to strangle you with. Whatever you do, have a very merry Christmas.

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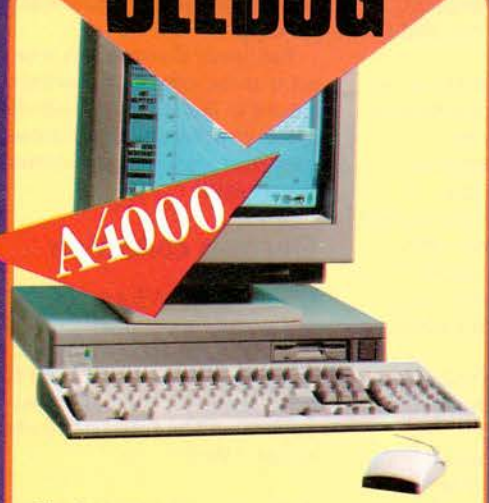

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Industry standards

YOUR comparison of industry standard PCs with Trabants (*Acorn Computing*, Comment, October 1993) is a good one and I agree completely.

But if Acorn computers are to be sold in Germany – except as games machines – they have to be compatible with PCs as upgrade buyers want to use their old datafiles and new buyers are looking for a good *price:performance* ratio.

In addition they often need systems explaining to them and there are more PCs around and so more people to help.

The technology alone will only appeal to a few enthusiastic freaks. Normal users and especially organisations need hardware and software for the day-to-day jobs. I think you have to concede that Microsoft and Novell offer such software for almost every task.

It would be very regrettable if Acorn and their software don't become rivals to MSWindows, Dos and Co. –
Erwin Schmutzer, Moenchengladbach, Germany

● **Steve Turnbull replies:** *In Germany the Acorn machines are making very good headway into the DTP market, in fact the usual judgement over there is that such powerful machines can't possibly be used for education – and hearing Acorn computers being accused of being "games machines" is wonderful...if only more people thought that way.*

The problem of data compatibility is a real one, but most software developers for Acorn realise it and deliberately build the ability to convert equivalent PC data into their packages.

But I must disagree with your final point about software, I challenge anyone to find a single day-to-day application for which an extremely competent piece of Acorn software doesn't exist.

Crimewatch

WHY don't you offer a service to readers so that if their computer and/or software is stolen they can just report it to you. You could have a list or database program on the MegaDisk or in the magazine containing details of every stolen computer and anyone wishing to buy a second-hand machine could consult the list first.

Surely such a system would increase the recover rate substantially. – **Richard North, Abbots Langley, Herts**

● *There are a number of ways to protect you machine relatively cheaply, from etching the screen to passwording the hard disk with programs, many of which are available in the public domain.*

Software is a trickier problem, but some programs have registration screens when they are first booted look for the ID chip in the latest machines.

You should always make a note of the serial numbers of your computer and monitor – and any other electronic equipment – just in case. Although your idea seems good at first glance it is fraught with difficulties when it comes to actual implementation.

Electron collection

I HAVE a set of old Electron User magazines which I don't want to throw out if I can find a good home for them. Do you think anyone will be interested? – **Mrs Gunn, Wick**

● *If you are interested please send your letters to Acorn Computing and we will send them on to Mrs Wick.*

Hard on the drive

I HAVE an A5000 (issue 2 board) which I am increasingly having to share with my children. However, most of the software they use is from floppy disk and although I am pleased to see them using the computer I cannot help wondering about the necessity for having the IDE hard drive on every time they switch on.

Being children, they do not use the machine for lengthy periods, more in short bursts, and this will only produce more rapid wear of the hard drive from the more frequent switching on and off – or so I am told.

It occurred to me that it might be possible to make up a switch for the hard drive so that it need only be on when I need to use it. I also know that there are several different voltages going into a hard drive so a switch on one wire only would not seem to be a good idea. Could you please let me know how to get around this?

I look forward to hearing from you if only to be reassured that the drive is not going to suffer from the frequent use it is getting at the moment. – **A.J. Morison, Edinburgh**

● *Be reassured. The hard disks are designed to take this kind of wear and tear and we'd be astonished if you notice any degeneration.*

Making assumptions

● IN his article The Soft Option, Clem Vogler wrote:

ArcTerm7 provides an accessible menu with well thought out configure options, including a quick setup for users with handbook phobia or whose wives/girlfriends/ mothers announce supper on the table at exactly the moment you finally make contact with that frequently engaged bulletin board.

I am registered on a local BBS and exchange E-mail with friends and acquaintances in the UK and USA. I subscribe to more lists than commonsense dictates and have an active character in a MUSE running at MIT. I am probably BT's best customer and yes, I use ArcTerm7 – and very good it is too.

I am also a wife and mother, and in my house people wait for their supper or get it themselves when I'm on-line. You should take Clem Vogler to task for his chauvinistic assumptions or else edit his copy a little more vigorously. – **Heather Rennie, Sherwood, Nottingham**

● *We all assumed that Clem was referring to his personal situation and felt no chauvinism was intended. But point taken.*

More on Clem

AS a modern language teacher with several year's experience of electronic communication, I really must take issue with Clem Vogler's omission of ArcComm 2 when *examining the available software* for 32-bit machines.

Neither ARCTerm7 nor HearsayII can emulate a CEPT1 terminal, which is the European standard for national public viewdata services.

Only ArcComm2 users can access the multi-coloured high-resolution pages of Austrian, Czech, Danish, Finish, German, Greek, Hungarian, Luxembourg, Norwegian, Portuguese, Slovenian, Spanish, Swedish and Swiss viewdata. They far surpass French Tèlètel and British Prestel with their chunky graphics. – **David Wilson, Forest Hall, Newcastle upon Tyne**

Back-up hang-ups

SOME years ago I obtained from Acorn a copy of their File, Archive and Restore (FAR) program which I have used to make

back-ups from my hard disk. The program allows you to make full or incremental back-ups and to be selective about the files your archive.

However, since upgrading to RISC OS 3 the program hangs up. I have written to Acorn but they say that they have not produced an upgrade. Has anyone else? Or is there another program which does the same job?

The program was so simple in operation, as it prompted you for which floppy drive to use then to show the program the previous archived floppies and store any changes since the last archive. – **F.J. Cruickshank, Epsom, Surrey**

● *Both RISC Developments and Dabhand Computing have packages that will do what you want.*

Call in the experts

A YEAR ago I approached a well-known high street store with a view to buying an A3010 and was told that I couldn't run my old BBC B software on it as it was a much too powerful machine.Tthis is not accurate, of course, and I went elsewhere.

Then I discovered my local dealer, Selective Computer Services of Weston-on-Trent in Derbyshire, and have been extremely pleased with their quality of service.

Buying Impression II was followed by a phone call to check if I had any problems. My new printer was delivered with the printer driver set up and a new set of Impression default documents to allow for the printer's own peculiarities.

They are ready to help over the phone or in person and much time and patience has been given to my (many) queries. I would like to thank them for their advice and support – far more that I ever expected. – **Jill Bell, Ashbourne, Derbyshire**

Auckland views

I HAVE an A5000 with an A3000 as emergency backup. Using these I scan my own photographs on an Epson GT-6000 scanner with the Irlam !Pro-iMage software which are loaded into Impression Junior for the City of Auckland Morris Dancers Events and Dance-Outs newsletter.

I bought !Titler and !Sequencer after having seen the demo on your disk last year and a local shop, Freetime Software, is running seven of my slide shows. People walk in when they recognise the pictures as local.

I actually started with shareware communication software on the A3000, on packet radio. I corresponded with Musa Manarow while he was aboard the MIR space station. Now I use !Hearsay II and multi-tasked with the satellite tracking program !Arctrack during the shuttle mission STS-58.

While the contacts were scrolling across the screen I watched Columbia, as an icon that I had created myself, travelling across the map. Four satellite tracking programs are available – one from SpaceTech, two from AMSAT UK, and one is PD, floating around in the university scene.

On the Packet Satellites I have to use Dos software on the Aleph One card. I need the hardware solution because the emulator can only handle 300 baud continuously through the serial port. I became proficient in Dos because I had to, in order to use the specialised satellite comms software.

The satellite comms stuff did not come in a usable form, but as a pile of files. Since I worked out a satisfactory directory structure that minimises duplication of the main routines, I learnt that our local satellite (PC) guru cannot use 75 per cent of facilities offered, because he is frightened of sub-directories and hard disk crashes. He has managed for years to disguise that fact.

But Dos is a religion. When people have come to terms with it, they become High Priests, savagely defending their hard-earned reputation. To them, if an operating system does not require a PhD to use, it is not an operating system.– **Henry Falkner, Devonport, Auckland, New Zealand**

Bugged ADFS?

I BELIEVE I have discovered a bug – or at least a serious anomaly – with the RISC OS 3.10 ADFS. I have been compiling a custom-written cricket database and was implementing a sort facility when the problem struck.

I had arranged a bubble sort whereby the program read two consecutive records from disk into two arrays, compared the appropriate fields, and then swapped the array elements if necessary. They were then PRINT#-ed to the disk and the program moved on a record. A very standard bubble sort algorithm.

The system worked for small quantities of data (about five records) but when it got to 38 records the computer fatally crashed with a *data lost* error and locked up.

Subsequent investigation revealed that it was the PRINT# statement itself that was causing the problem. Purely in the interests of research I copied the program into a ram disk and, lo and behold, it worked first time.

Curiosity sent me to copy it to the hard disk. It worked. All this would seem to point to an obscure bug in the ADFS with RAMFS and either IDEFS or SCIFS, whichever controlled the hard disk unaffected. However, my A5000 IDE hard disk is controlled by the ADFS as well.

I presume that the filing system uses the same code to channel data to a disk with the medium-specific ports actually writing the data. This would seem to mean that we are looking at a floppy-specific error.

Of course, it is possible that my own code is at fault, but as it works on two filing systems and not the third I don't think this is the case. Has anyone any thoughts on this? – **David Seery, Littleborough, Lancashire**

● *The Data lost error occurs when ADFS attempts to write buffered information to the storage media and then finds an error, which could be a write-protected disk.*

ADFS will allow you to open a file for writing to a disk that is protected, but not send the data, of course. While not impossible, I think it highly unlikely that the kind of error you're describing could have gone unnoticed.

Shot in the arm

It's not our usual policy to print letters that praise us – it's a bit too egocentric and of no real interest to other readers – but we'd had a bad day and this one cheered us up:

Acorn Computing just continues to get better, thanks to the inclusion of some more technical/programmer's articles – I refer to TechForum and the Heap management article in the December issue. – **Richard Blythe, Newquay, Cornwall**

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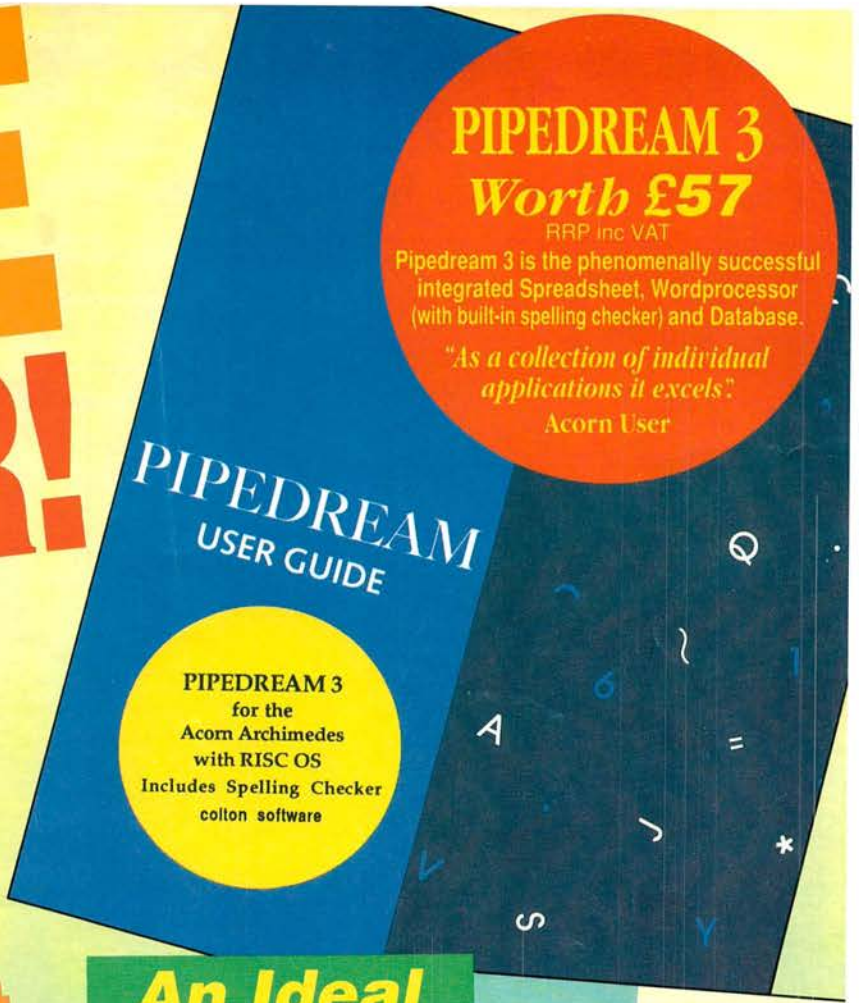

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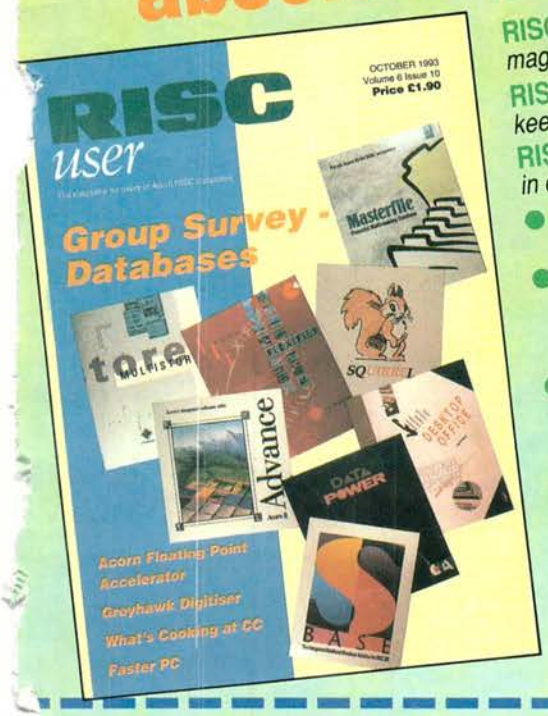

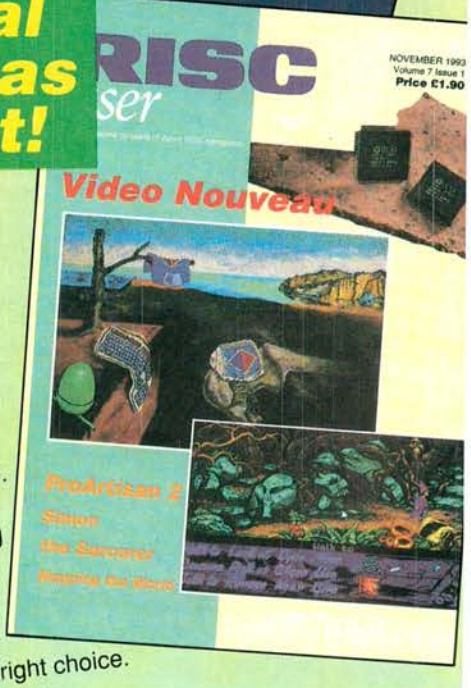

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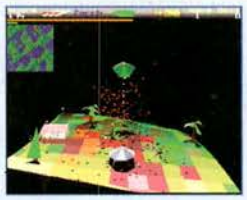

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